ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

JANUARY 1953

PRICE FIFTY CENTS

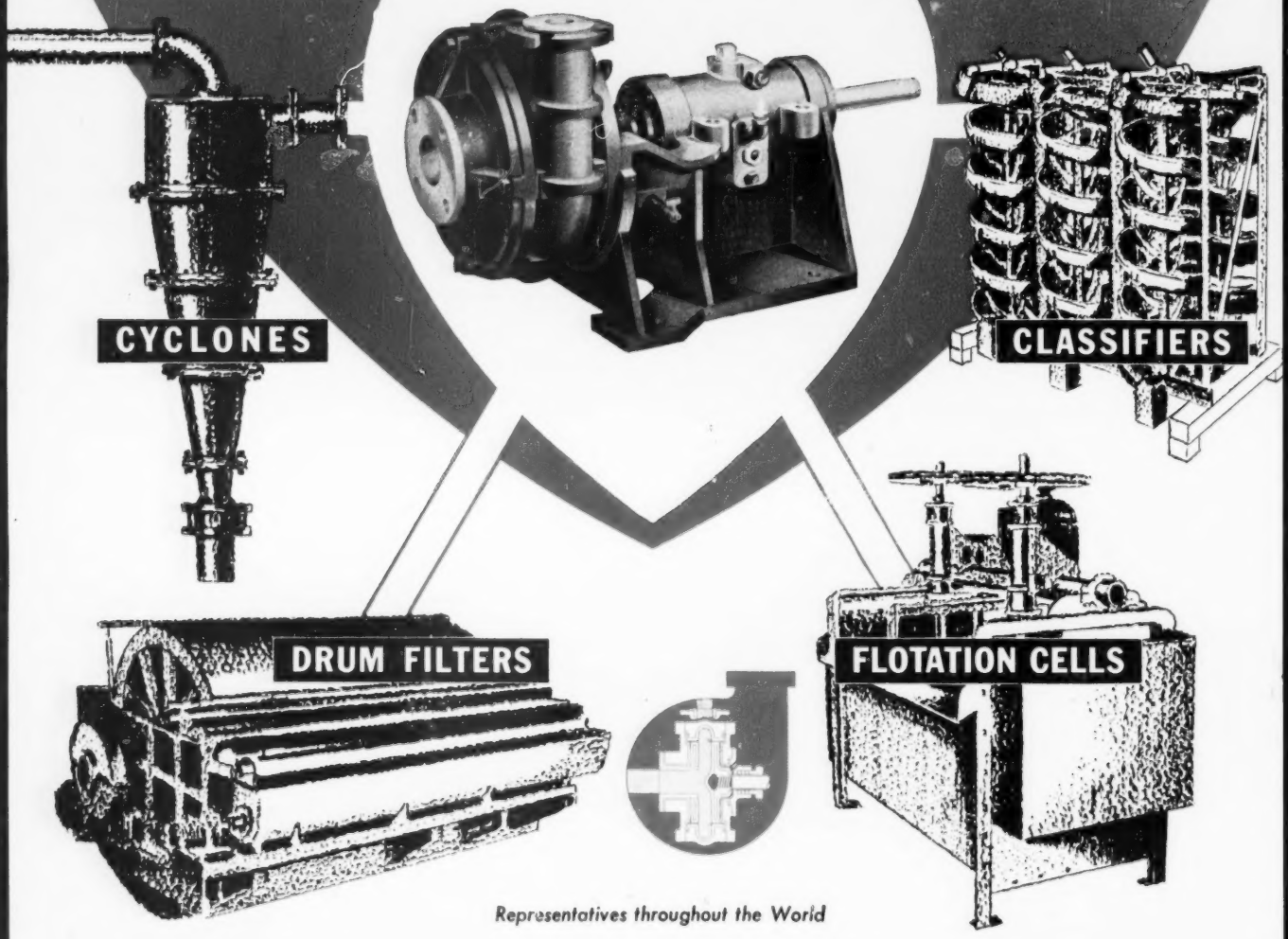
FOUNDED 1866

WHITE PINE COPPER . . .

Its plans for mining, milling and smelting – A 16-page feature article on this important new project, starting on p. 72

THE HEART OF THE PROCESS

Proper functioning of each component in a process depends on the kind of steady performance that you get from Hydroseal Pumps . . . and the kind of experience that assures the proper application of control equipment. Ask an operator who uses Hydroseals. Then ask our engineers to help you.



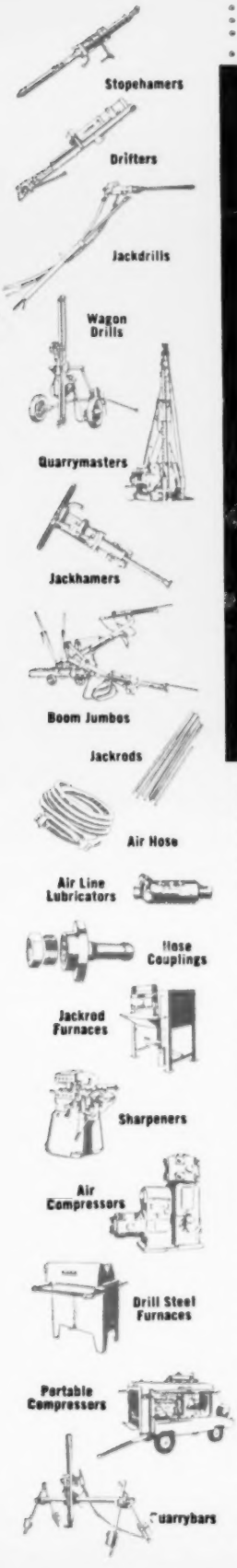
Representatives throughout the World

THE ALLEN-SHERMAN-HOFF PUMP CO., Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.

HYDROSEAL

SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD



Everything for Drilling Rock

FROM THE CARSET JACKBIT BACK TO THE COMPRESSOR

TO make the best recommendation for rock drilling equipment you must imagine yourself in the bottom of the drill hole. That's where the real results show up. From there you see only the Carset Jackbit.

But behind this Carset Jackbit there's a completely coordinated line of Ingersoll-Rand rock drilling equipment. Current models of Drifters, Stopers, Jackhamers, Wagon Drills, Jackdrills and Quarrymasters were all designed to take full advantage of longer-lasting, faster-drilling Carset Jackbits. Add rod and bit shop equipment, mountings, accessories and air compressors, and you have a complete I-R line backed by 80 years of experience, unequalled rock drilling know-how and undivided responsibility.

The Carset Jackbit with correct I-R supporting equipment is cutting rock-drilling costs, cutting operator fatigue and increasing production the world over. Whatever your drilling problems, consult your local I-R representative. He can help you solve them.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

837-5

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESEL AND GAS ENGINES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Where failures meant shutdowns they changed to grommet belts

B. F. Goodrich grommet V belts last 20 to 50% longer

Crushing rock puts terrific shock loads on the V belts that drive the crusher. When the drive stops because of premature belt failure, the whole operation shuts down, deliveries are delayed. The stone company wanted reliability—and got it—when a set of B. F. Goodrich grommet V belts was installed. In spite of the shaking, jolting action, the grommet V belts on this crusher have already given two years of trouble-free service, and are still in excellent condition. Here's why B. F. Goodrich grommet V belts outlast and outperform ordinary belts.

No cord ends

A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength

All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less—only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

They cost no more

Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D and E sections. But remember, only B. F. Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Grommet V-Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

VOLUME 154 87th YEAR OF PUBLICATION NUMBER 1

JANUARY, 1953

E&MJ Outlook	67	Behind the By-Lines	70
Market Summary	68	Editorial	71

White Pine Copper Project — R. H. RAMSEY — 72

Bethlehem Steel's New Grace Mine — A. W. KNOERR — 88

What Too Much Safety Factor Can Do in Operating Centrifugal Pumps — F. R. FORREST — 91

What the Uranium Prospector Should Know About Radiation — ROBERT J. WRIGHT — 92

Improved Flowsheet Increases Recovery and Mill Capacity — 96

The Safety Hat Pays Off — R. C. BECKSTEAD — 98

Keeping Tab on Practice — 100

- Replacement of Rock Bolts With Used Hoisting Rope Cuts Cost — 101
- Special Linings Successful with Abrasive Sands at Trail Ridge Plant — 102
- Vibroflotation Process Used in Preparing Plant Site on Sand — 104
- Downhill Belt Conveyor System Lowers Iron Ore 400 Ft. — 106
- Cost of Big Draglines Justified by Advantages Obtained — 107

Operating Ideas	112	New Products Digest	121
Washington Impact	116	This Month in Mining	128
Personals	118	New Books	166

ALFRED M. STAEHLE, Publisher **R. H. RAMSEY, Editor**

A. H. HUBBELL, Managing Editor; Associate Editors: J. B. HUTTL, San Francisco, A. W. KNOERR, G. P. LUTJEN; Market Editor: H. H. WANDERS; Assistant Editor: C. W. CROASDALE; Copy Editor: P. E. REED; Layout Editor: F. A. ZIMMERLI; Consultant: G. J. YOUNG; Washington: M. A. REICHEK.

R. W. DAVIS, Advertising Sales Manager

Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are solicited only from management, production, and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

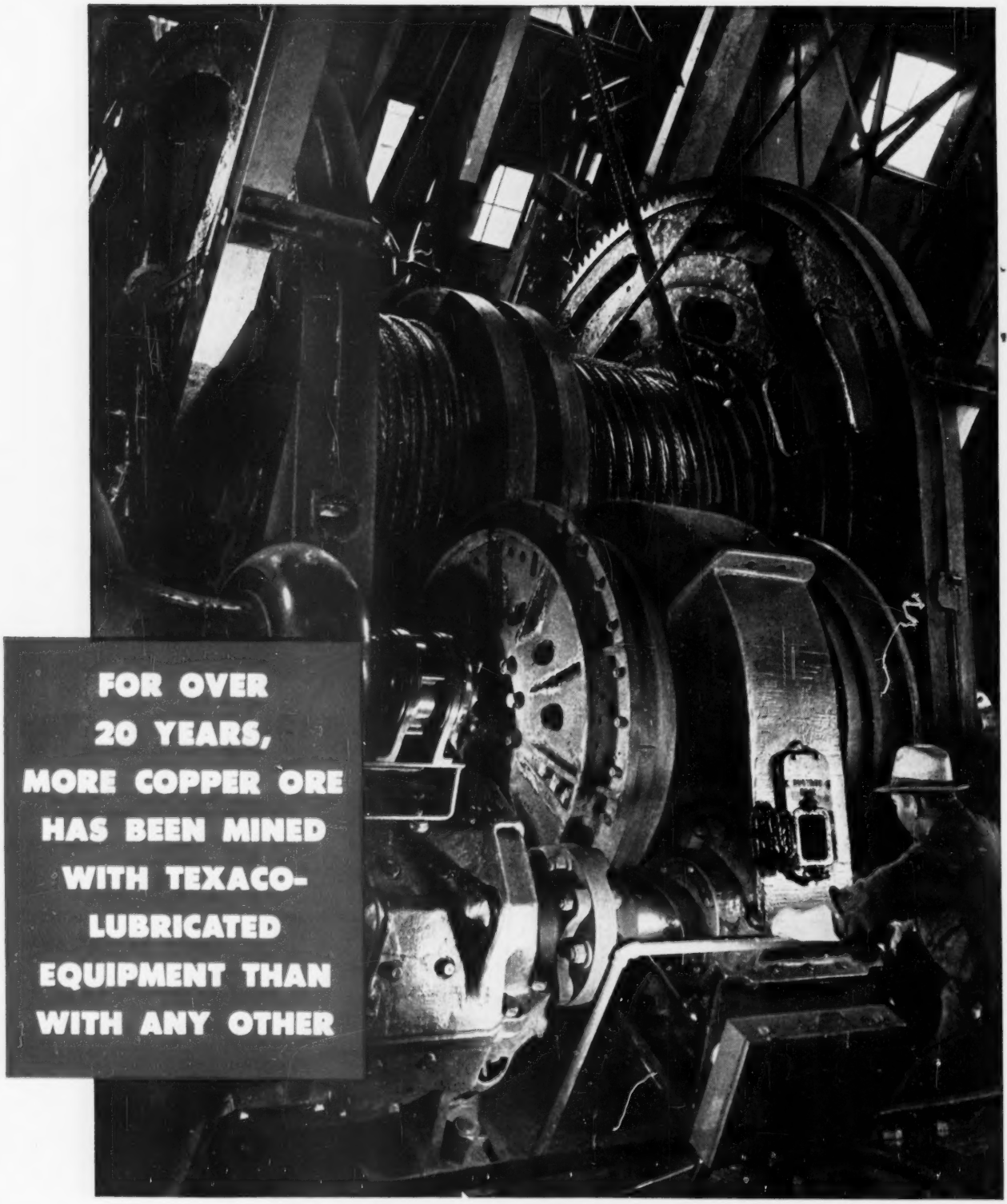
A McGRAW-HILL PUBLICATION

Member of Associated Business Publications and Audit Bureau of Circulations

Branch Offices: San Francisco 4, 68 Post St.; Chicago 11, 520 N. Michigan Ave.; Los Angeles 17, 1111 Wilshire Blvd.; Washington, D.C., National Press Bldg.; Pittsburgh 22, 719 Oliver Bldg.; Detroit 26, 856 Penobscot Bldg.; Cleveland 15, 1510 Hanna Bldg.; Boston 16, 350 Park Square Bldg.; Philadelphia 3, 17th and Sansom Sts.; Atlanta 3, 1321 Rhodes-Haverty Bldg.; St. Louis 8, Continental Bldg. District Managers: New York T. E. Alcorn; New York and New England, John B. Lewis; Philadelphia, W. A. Potter; Cleveland, W. M. Spears; Pittsburgh, H. C. Chellson; Chicago, C. J. Coash; San Francisco, J. W. Otterson; Atlanta, R. O. Maultsby; Los Angeles, C. W. Dysinger; St. Louis, F. W. Roets; London Address McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon Street, London E.C. 4, England. Cable address: McGraw-Hill, London. Other McGraw-Hill foreign news offices in Paris, Berlin, Moscow, Prague, Shanghai and Mexico City.

Price of this issue 70c. Subscription rates: United States and possessions, $3 a year, $4 for 2 years, $5 for 3 years. Other Western Hemisphere, $5 a year, $8 for 2 years, $10 for 3 years. Elsewhere $15 a year, $25 for 2 years, $30 for 3 years. **Please indicate position and company connection in all subscription orders.**

Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa. under the Act of March 3, 1872. Copyright 1953 by McGraw-Hill Publishing Co., Inc. — All Rights Reserved. Printed in U.S.A.



TUNE IN . . . TEXACO
STAR THEATER
starring MILTON BERLE,
on television
Tuesday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO
REG. T.M.

LAST LONGER

RUN SMOOTHER

with TEXACO CRATER

Put *Texaco Crater* on your wire ropes. It *penetrates* — quickly and thoroughly — coating each strand with a long-lasting, protective film that guards against wear and rust, surrounding the core to prevent its drying out. Nothing like *Texaco Crater* for keeping your wire rope strong longer and bringing down your maintenance costs.

Nothing like *Texaco Crater*, either, for assuring better service and longer life from your open gears. The tough, clinging film on each gear tooth muffles noise and reduces wear.

For more convenient application, use *Texaco Crater X Fluid*. It's the same fine lubricant designed to *go* on as a liquid and *stay* on as a tough, protective coating that really lasts.

In all types of mine car wheel bearings, use *Texaco Olympian Grease*. It assures easier starts both winter and summer, smoother operation, lower maintenance costs.

A Texaco Lubrication Engineer will gladly give you full information. Get in touch with him through the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

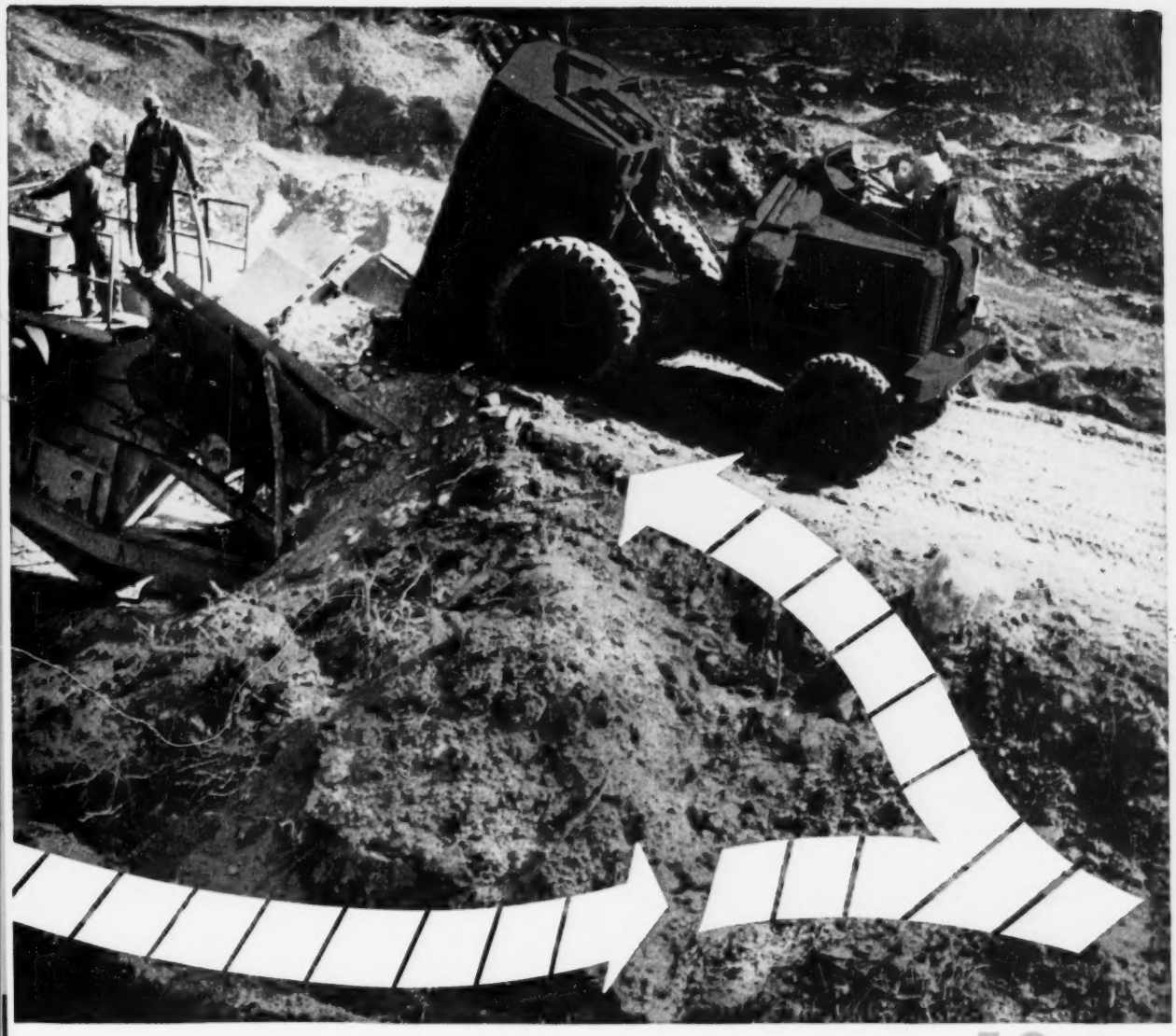
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY

NO-TURN SHUTTLE HAUL

In confined underground operation, fast-shuttling Dumptors are ideal for no-turn hauling in tunnels and along narrow passageways. Also note how low rear entry to Dumptor body permits easy loading under low ceiling. Compact body is 8' x 8' for loading over end or sides.

This mountain-side job shows typical no-turn shuttle advantage. Hauling along narrow ledge, Dumptor spots close to Koehring 1½-yard 605 — gets its load, drives to fill, dumps, and returns to the shovel — without turning. Dumptors are operated with equal ease in both directions.



increases hourly output over 10%

With Koehring fast-shuttling Dumptors, there is no need to turn at the loading unit, along narrow haul roads, or at the dump. Koehring constant-mesh transmission gives the same 3 fast speeds forward and reverse. Every turn saved cuts 15 seconds off your cycle time, and adds up to a big increase in yards hauled per hour.

On a 1,000-foot haul, eliminating only 2 turns saves ½ minute every round trip. Where you would get an average of 13.6 trips per hour with 2-turn operation, Dumptor *no-turn shuttle hauling* gives you 15.4 trips. That's an increase of 1.8 trips an hour on the same, 1,000-foot haul.

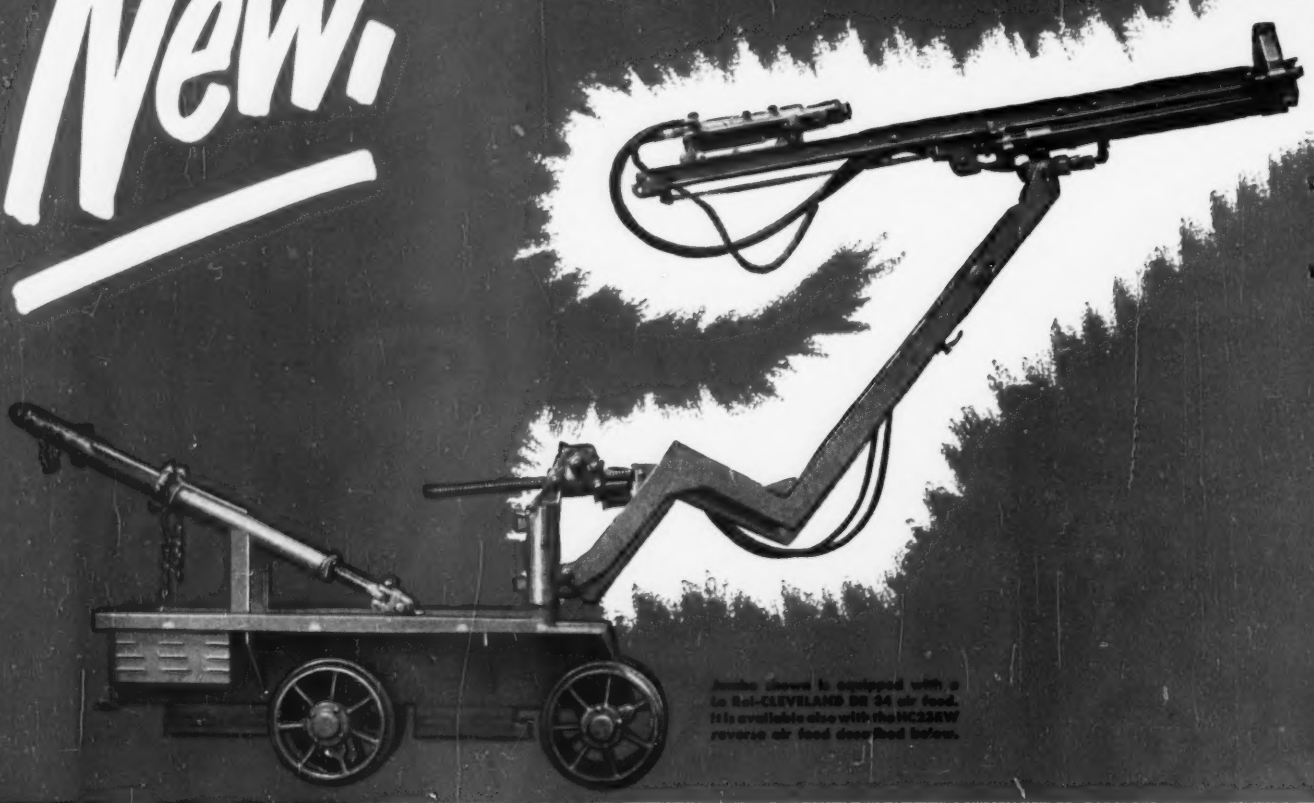
Fast, easy spotting and 1-second gravity dump also help keep production high. Your Koehring distributor can show you many other cost-cutting advantages with heavy-duty, 6-yard Dumptors.

KOEHRING COMPANY, Milwaukee 16, Wis.

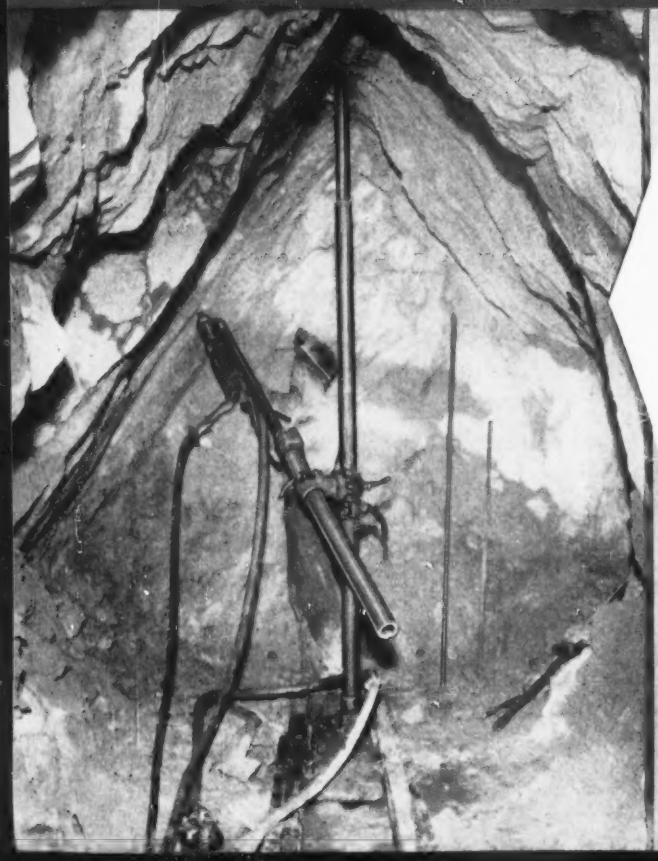
KOEHRING DUMPTOR®

Subsidiary Companies: JOHNSON • PARSONS • KWIK-MIX

New! Speeds up



Jumbo shown is equipped with a Le Roi-CLEVELAND DR 24 air feed. It is available also with the HC23RW reverse air feed described below.



Miners like Le Roi-CLEVELAND HC23RW Reverse Air Feed Drifters

Management does, too

Faster Steel Changes! No swing or dump nuts to loosen and reset. Your miners simply swing drifter on feed cylinder and change steels. It's not only easy — it lets them drill out the round faster.

No Stuck Steels! Positive air feed keeps drills working at peak efficiency, avoids stuck steels.

Higher Drilling Speeds! Positive air feed plus proper force of blow and strong rotation give faster drilling speeds with both steel and tungsten carbide bits. You get longer bit life, too, and drill more footage.

Low Upkeep Cost! No feed screws or feed-screw nuts to wear. No complicated power-feed mechanism to give trouble.

Easy to Operate! Built to lighten the load on your miners. Feed controls conveniently located. Reverse air feed withdraws steel from hole quickly.

Faster Set-ups! The combination of Le Roi-CLEVELAND Air Feed Drifters and air columns gives you a unit that can be set up easily and quickly. And you can get the air column in any height you want.

drilling cycles

Le Roi-CLEVELAND *self-leveling* Mine Jumbo

with four-foot steel-change Air Feed Drifter

Saves time drilling lifters! Lets your miners drill the right round for any ground!

You couldn't ask for more from a mine jumbo than the performance you get from this new Le Roi-CLEVELAND. It's got plenty of stuff. And the payoff for you is faster cycles, greater tonnage per man-shift, lower costs! Here's why:

Self-leveling, air-motor-powered arm, lets miners spot and space holes quickly and easily, for the most efficient fragmentation. They don't have to loosen a bolt or tilt a boom, to complete the drilling cycle.

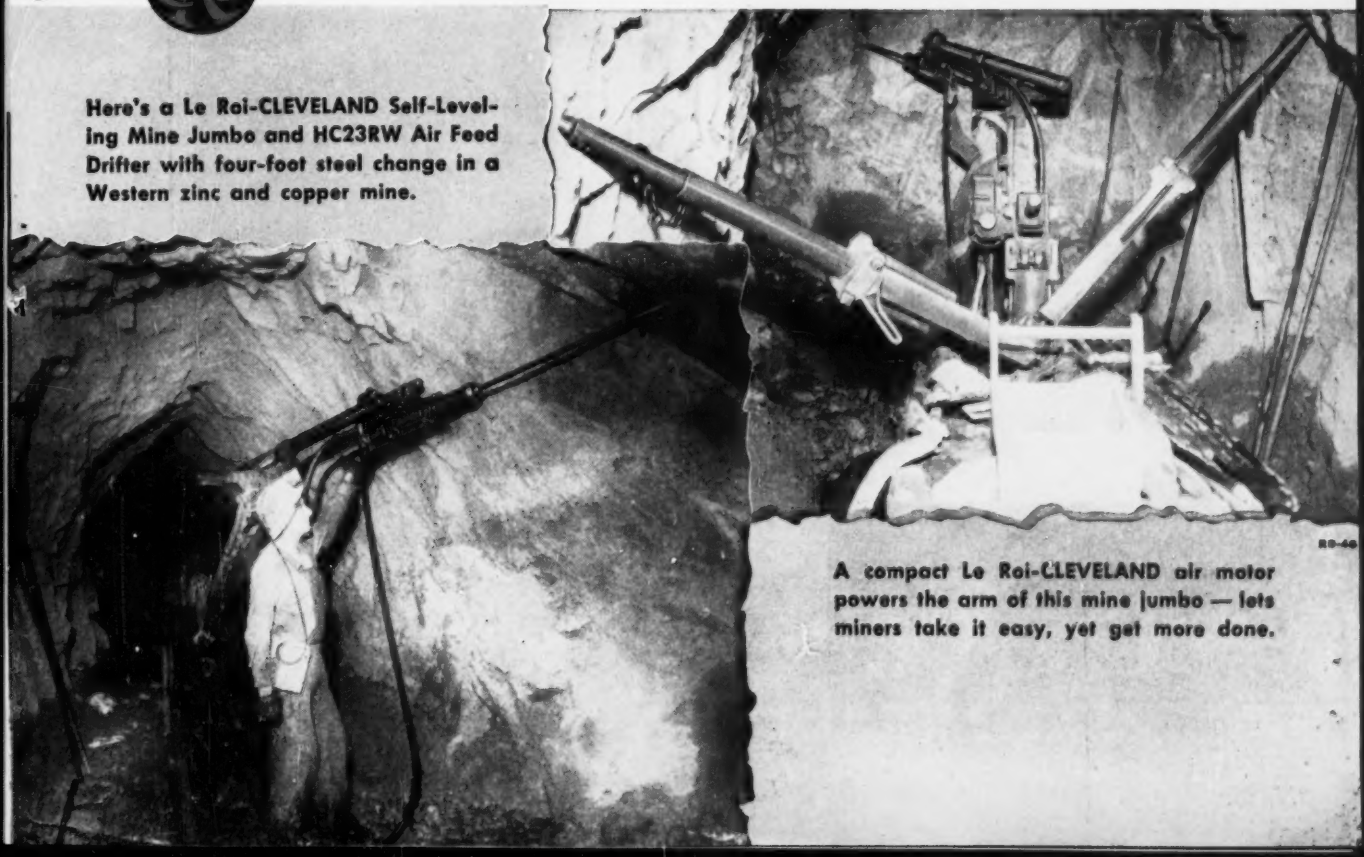
Exclusive rigid screw and gearing mechanism keeps the heading straight, cuts down overbreak and underbreak. Keeps the drifters in line, prevents the steel from binding, reduces chuck wear.

Offset arm provides plenty of clearance to drill lifters — without having to take time out to swing the drill under the arm.

You can get this Le Roi-CLEVELAND Self-Leveling Mine Jumbo in either single-arm or double-arm construction. Write for further information and see for yourself how either model can help you get more done every shift.

LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, O.

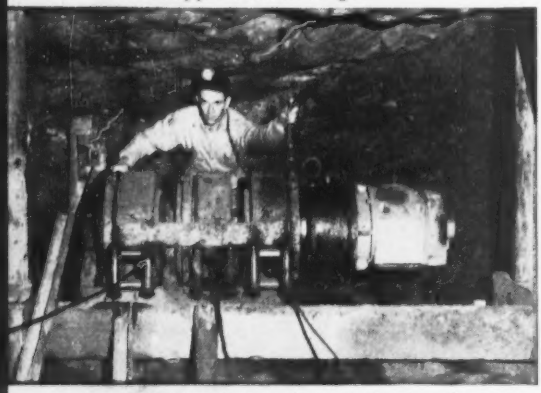


Here's a Le Roi-CLEVELAND Self-Leveling Mine Jumbo and HC23RW Air Feed Drifter with four-foot steel change in a Western zinc and copper mine.

RD-46

A compact Le Roi-CLEVELAND air motor powers the arm of this mine jumbo — lets miners take it easy, yet get more done.

JOY AAF-211 *double-drum slusher in a lead-zinc mine. Mounted on a turntable, scrapes alternately from two headings.*

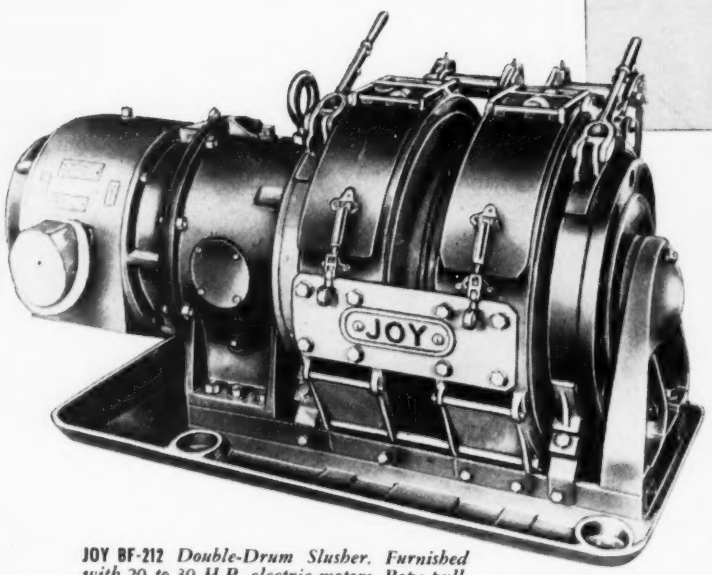


JOY AF-311 *three-drum slusher in a large open stope in a western copper mine.*

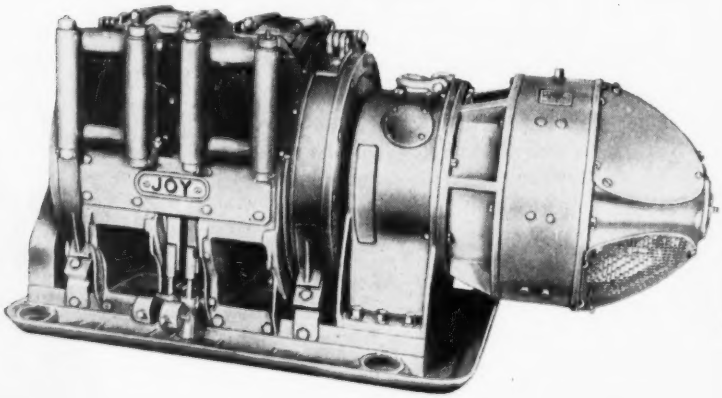
JOY AAF-211 *double-drum slusher in a cut-and-fill stope in a copper mine.*

JOY BF-211 *double-drum slusher pulling ore to a chute in a Michigan iron ore mine.*

Here's why



JOY BF-212 *Double-Drum Slusher. Furnished with 20 to 30 H.P. electric motors. Rope pull, with drum half-full of rope, up to 3700 lbs.*



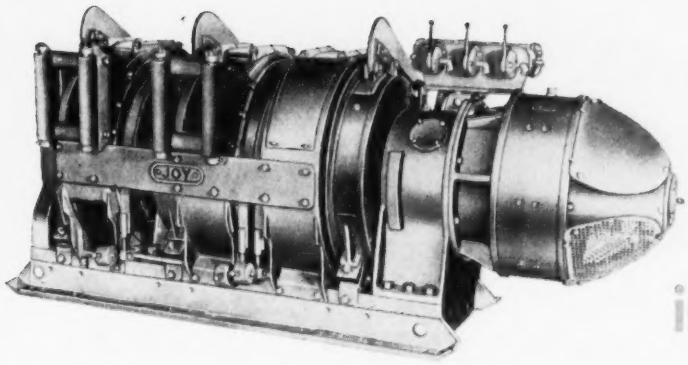
JOY CF-211 *Double-Drum Slusher. 30 to 60 H.P. electric motors. Rope pull up to 6800 lbs., with drum half full of rope.*

AMSCO SCRAPERS . . . built entirely of high (13%) manganese steel for longer life and lower maintenance. Three models—lightweight unit-type, medium weight welded-type, and heavy weight bolted-type, in sizes from 26" to 72".

JOY QUICK-OPENING TAIL ROPE SHEAVES . . . with patented "Snatchblock" construction—sealed-for-life bearings—water-tight and dust-tight bearing seals—made of heat-treated alloy steel.

JOY SLUSHERS

set the standards for the industry



JOY CF-312 *Three-Drum Slusher equipped with air-clutch control for ease of operation. Electric motors from 30 to 60 H.P. Rope pull, with drum half-full of rope, is up to 6600 lbs.*

They're used and preferred in every mining field— because:

- Their simple, compact design and rugged construction insure a long lifetime of trouble-free service under the roughest conditions.
- The power unit can be easily removed, transported to the shop and overhauled without bringing the slusher above ground.
- Automatic band-type brakes furnish retarding action, during unwinding, which eliminates backlash.
- Open clutch bands dissipate heat quickly and permit easy inspection of linings. It's but a two-minute job to remove clutch for renewal of lining.

Joy Slushers are produced in over 300 types and sizes—from 3 to 150 H.P. Consult a Joy Engineer for the size and type best for your scraping job. ● *Write for Bulletin 76-Y.*

Have you seen this film?

"HARD ROCK MECHANIZED MINING"

16MM—Sound and Full Color—40 Minutes

Write for a FREE Showing

Address our Film Booking Office.

OVER 100 YEARS OF ENGINEERING LEADERSHIP

Consult a Joy Engineer

W&D M 4029

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

"Bedeviled Copper" helps to build a battleship

• The hard, ductile, malleable metal known as NICKEL derives its name from "kupfer-nickel", meaning *bedeviled copper*, a name given it by superstitious medieval Saxon miners. These miners, in uncovering what appeared to be a fresh lode of silver ore, thought the devil of the earth, *"Old Nick"*, had cast a spell over their ore since it could not be hammered into useful articles . . . *and it was several hundreds of years later that Cronstedt's discovery led to the actual recognition of nickel.*

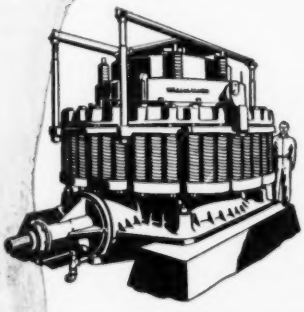
Among the thousands of ways in which nickel now serves man is in the construction of a modern battleship—where this versatile corrosion-resistant metal is used in armor plate, gun tubes, and scores of other ordnance, navigational and communications material.

From the opening of the first Sudbury mine in 1886, the history of nickel is largely that of *International Nickel Company*, who today produce fully 75% of the world's total nickel output. Playing an important role in International Nickel Company's production are twenty *"SYMONS"* Cone Crushers . . . which are recognized throughout the world for their ability to efficiently produce a great quantity of finely crushed product at low cost.

Thus, through the 20 "SYMONS" *Cone Crushers at "Inco" mines passes the majority of nickel used today . . . one more example of a job well done by* "SYMONS" *Cones.*

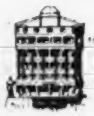
C652

NORDBERG MFG. CO., Milwaukee, Wisconsin



• **"SYMONS" Cone Crushers . . . *the machines that revolutionized crushing practice* . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter —in capacities from 6 to 900 tons per hour.**

"SYMONS" . . . A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD



"SYMONS" Primary Crushers

Grinding Mills

Mine Hoists

"SYMONS" Vibrating Bar Grizzlies and Screens

Diesel Engines

NORDBERG MACHINERY

NORDBERG

"SYMONS" SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON • TORONTO
MEXICO, D.F. • LONDON • PARIS • JOHANNESBURG

AVOID

the little losses that can break you . . .

BUY A NORTHWEST

SMALL breakdowns and adjustments mean small losses but small losses total into large losses and nick real holes in the profit on the job,

That's just another of the many differences between Northwest equipment and others—you are free from the constant annoyance of ever recurring minor adjustments and small breakdowns that cut the output, delay the trucks and slow the job down.

Northwests have proved their dependability on all classes of work. Northwest greater simplicity of design makes upkeep easy and reduces adjustments. Avoid the *little* losses that can break you! Plan now to have a Northwest. Talk it over with a Northwest man and follow the Northwest Crowd.

NORTHWEST ENGINEERING COMPANY
1509 Field Bldg., 135 South LaSalle Street, Chicago 3, Illinois

Successful Contractors Stay Successful with Proved Equipment

SHOVELS ■ CRANES ■ DRAGLINES ■ PULLSHOVELS

Hard-rock tunnels unlock reserves of Pennsylvania Anthracite

Bethlehem hollow drill steel fitted with detachable bits bores 8-ft holes into abrasive sandstone at the heading of this cross-section tunnel, about 7 ft high and 10 ft wide, at Glen Burn Colliery.

Tunnels driven deep into the mountains of Eastern Pennsylvania don't often make headlines because most of these bores are a familiar phase of long-range programs for opening up anthracite reserves well in advance of mining operations.

Galen H. Messner, an independent contractor, has been identified with hard-rock jobs in the anthracite region for more than thirty years. He specializes in development tunnels, slopes, and shafts. Some of his contracts call for driving steep rock holes for use as loading chutes and for ventilation; other jobs involve haulageways several miles long.

One of his current contracts is the driving of a cross-section tunnel at the Glen Burn Colliery, Shamokin, Pa. This type of tunnel, usually about 1200 ft long with a one-half per cent grade, is driven at right angles to a haulageway and cuts through the anthracite veins which occur here in narrow, steeply pitched seams.

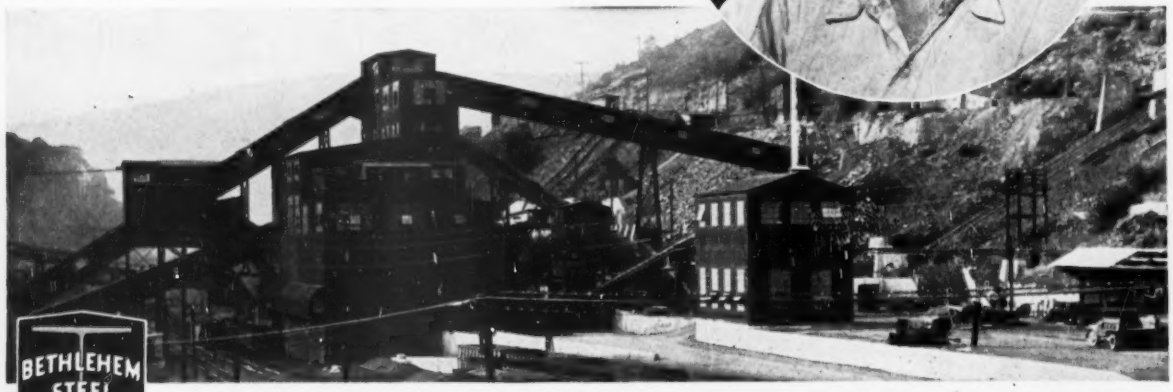
In drilling a typical round, hand-cranked drifters on column mountings bore 8-ft holes through sandstone, shale, and hard conglomerate, using Bethlehem hollow drill steel fitted with detachable bits. Loaded by a two-drum air hoist, muck is hauled by mules—yes, real live mules!—to the nearest haulageway.

Galen H. Messner, veteran Shamokin contractor, has driven more tunnels than he can remember. He operates his own shops for reconditioning bits and rods. About Bethlehem hollow drill steel, he offered this terse comment: "Well, I've been using it exclusively for better than twenty years. What more can I say?"

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

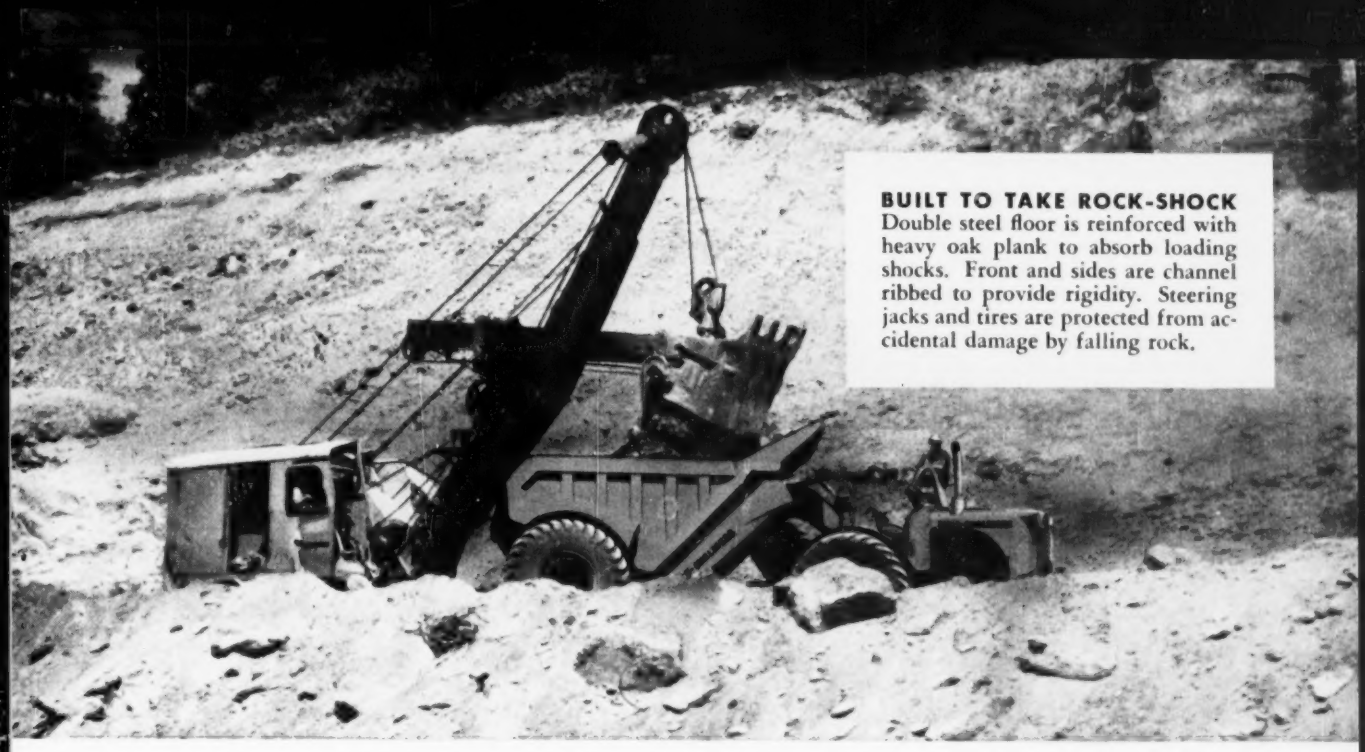
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Glen Burn Colliery at Shamokin, Pa., is operated by Susquehanna Collieries Division of M. A. Hanna Co. This mine has produced high-grade anthracite for 100 years.



BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL



BUILT TO TAKE ROCK-SHOCK Double steel floor is reinforced with heavy oak plank to absorb loading shocks. Front and sides are channel ribbed to provide rigidity. Steering jacks and tires are protected from accidental damage by falling rock.

modern, high-production demands call for strength, stability, speed

you get them all with the Allis-Chalmers rear-dump MOTOR WAGON

DUMPS SAFELY . . . CLEANLY — Wheel base remains constant during entire dumping cycle. With this stable wheel base, operator may back to the very edge of a steep fill, set the powerful air brakes on *all four* wheels and put the entire load over the edge.

Clean interior, plus high, 70-degree tilt assures complete load ejection. Body may be heated by exhaust to prevent freezing of materials in severe temperatures.

MULTIPLY TRACTOR USE WITH INTERCHANGEABLE SCRAPER BODY . . . for stripping and other self-loading operations. TS-200 Motor Scraper is a high-speed, rubber-tired unit with 13-yard capacity, "through-the-center" boiling action for easy loading, positive forced ejection and many other high-production features.

Ask your Allis-Chalmers dealer for the full story.

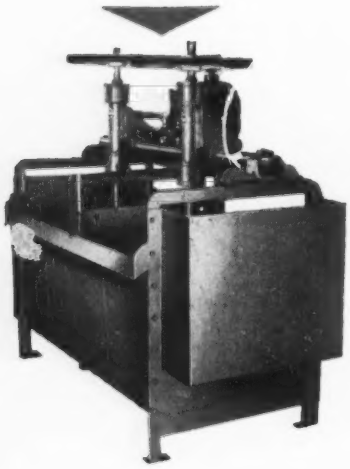
TRAVELS FAST — High horsepower-to-yardage ratio and large, high-traction rock-lug tires give fast average travel speeds — even on adverse grades and heavy going. Delivers more loads per hour; reduces idle shovel time.

ALLIS-CHALMERS MODEL TR-200 REAR-DUMP MOTOR WAGON

Choice of Engines—165 hp. Cummins; 176 hp. Buda.
Capacity — 15 cu. yd., heaped; 18 tons.
Speeds — Five forward to 21.6 mph.; reverse to 2.5 mph.
Hydraulic steering and dumping.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Flotation Jobs Don't Come Too Big for AGITAIR



The picture above shows only half of the batteries of Agitair Flotation Machines used in this vast installation for copper ore production.

Men responsible for operations like this know where they're going far in advance of setting the wheels in motion. They rigidly pre-test such items as power consumption, flexibility of control, cost of operation and maintenance, reagent consumption, wear and tear on mechanism and rubber parts, vibration and metallurgy.

Agitair measures up on every count. And that is why Agitair Flotation is chosen for efficient ore recovery in all parts of the world. A written request will bring you our Agitair Bulletin No. 48.

Leaders in Experience and Service

HOME OFFICE
545 West 8th South
Salt Lake City, Utah
P. O. Box 209

EASTERN OFFICE
921 Bergen Avenue
Jersey City, New Jersey

Agents In All Principal
Foreign Mining Districts

THE GALIGHER CO.

METALLURGICAL DIVISION · THE GALIGHER COMPANY · ENGINEERING SERVICE

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

"It Throws It Over Its Shoulder"

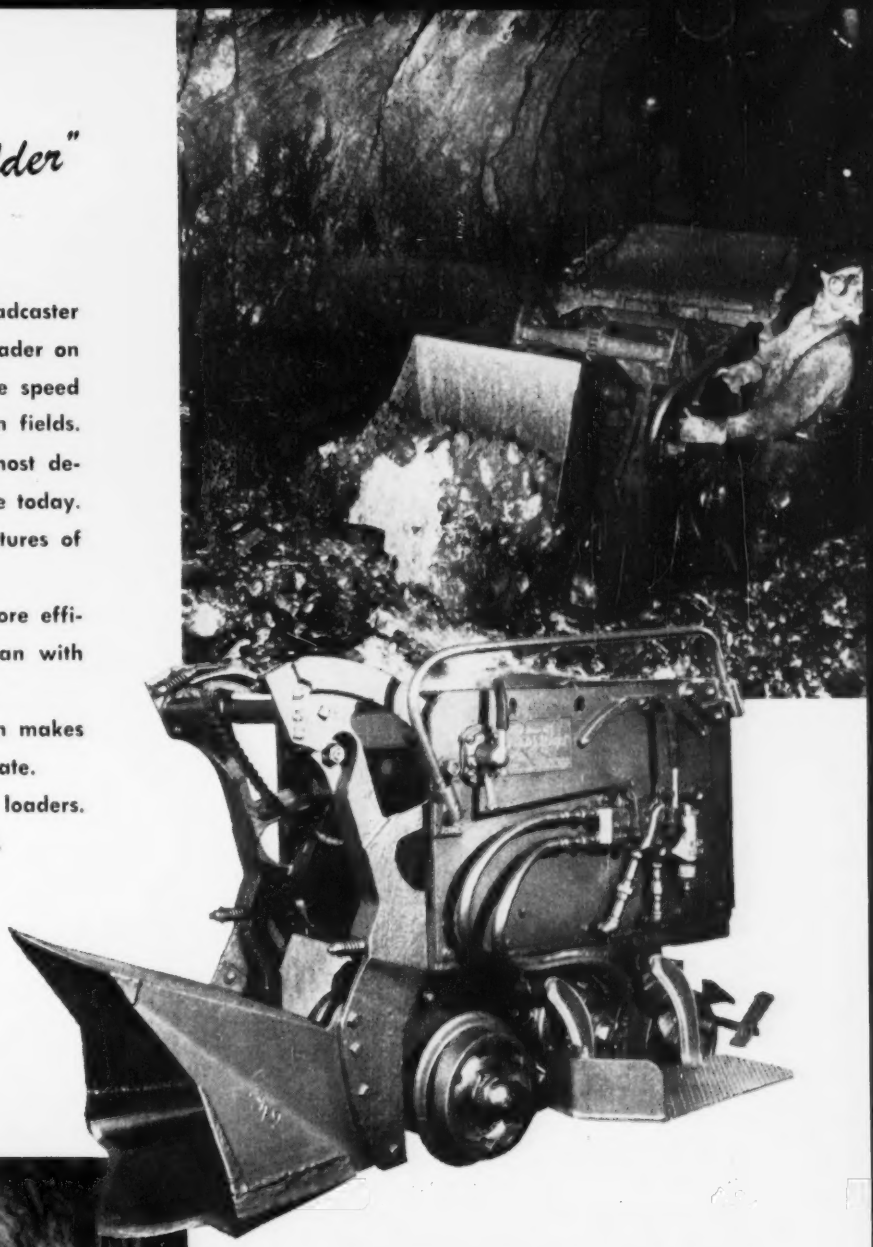
This is the way a famous news broadcaster explained the operation of an Eimco loader on a recent TV program remarking on the speed of the machine as seen in the Uranium fields.

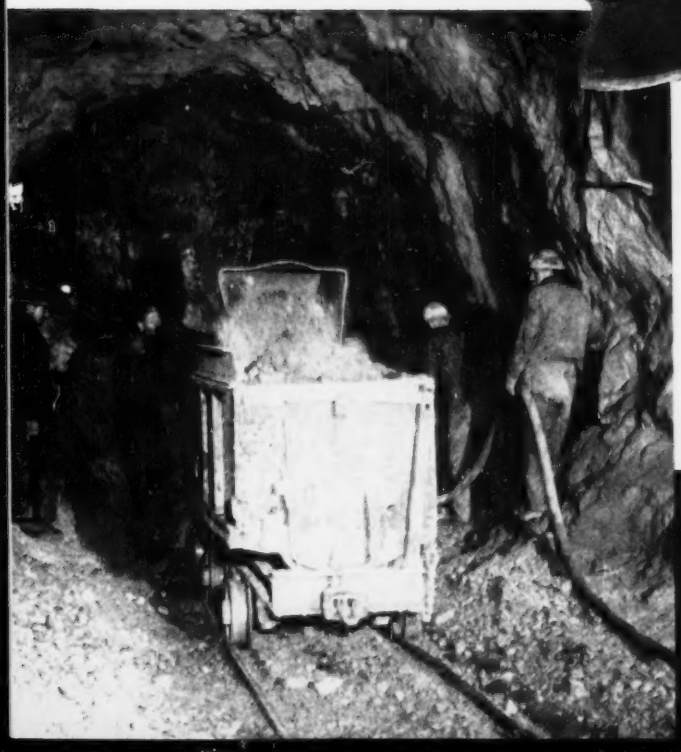
Speed and dependability are the most desirable features in any loading machine today. These are the two most prominent features of all Eimco loaders.

The Eimco design permits faster, more efficient operation with greater safety than with any other loading equipment.

Its heavy-duty cast-steel construction makes it the most dependable, easiest to operate.

Write for information on Eimco loaders. There's an Eimco for every loading job.





Above — Eimco Model 21 Loader available for track gauges from 18" to 48" and with coupler to couple your car. Powered by two powerful Eimco 5-cylinder radial type air motors.

EIMCO

A422

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

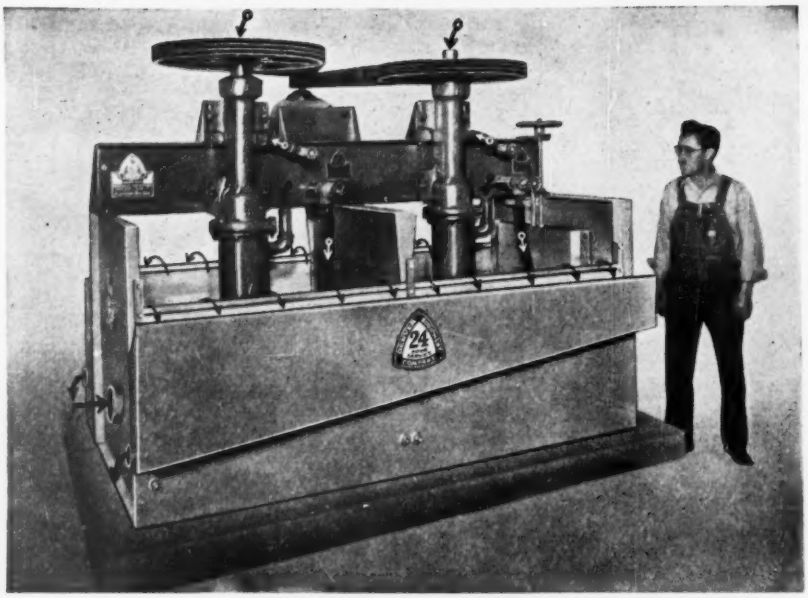
EXECUTIVE OFFICES AND FACTORIES - SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

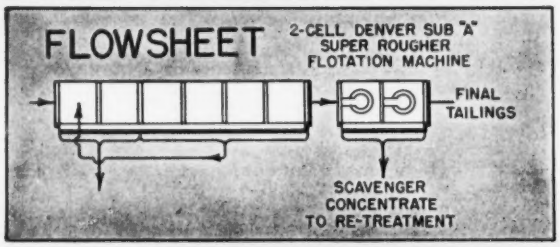
NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA S.P.A., MILAN, ITALY

Recovery of minerals normally lost in tailings has been amazing due to use of the New Denver "Sub-A" Super Rougher Flotation Machine. The ability of these machines to lower tailings and *pay for themselves in a short time* has been proved.

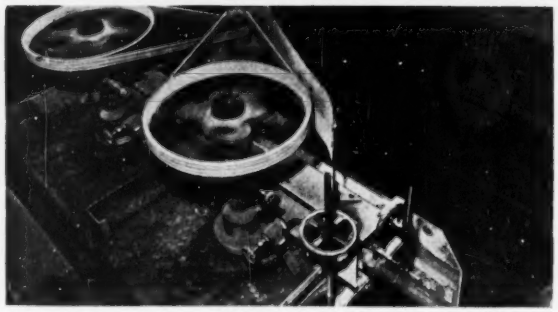


NEW DENVER "SUB-A" SUPER ROUGHER REALLY GETS PROFITS FROM TAILING CIRCUIT



New "Sub-A" Principle

The New Denver "Sub-A" Super Rougher Flotation Machine has a double impeller mechanism—one imposed above the other. The upper impeller gives additional aeration and lifts lagging mineral over the froth overflow. This super aeration gives a deep frothy concentrate. The openflow type tank design handles large tonnage. Froth overflows both sides for quick removal of the difficult to float minerals. Many features of flexibility are provided to give the operator an opportunity to adjust cells for the particular ore being treated.



Trial Offer

We are so confident that Denver "Sub-A" Super Rougher Flotation Machines will lower tailings in your mill that we want you to see for yourself what this machine will do. We will send you one of these NEW Denver "Sub-A" Super Rougher Flotation Machines to try out in *your* mill. If you are not satisfied, just return the machine to us without obligation.

ABOVE: Operators estimate $30,000 per year saved by lowering tailings losses. BELOW—another new large mill equipped with Denver "Sub-A" Super Rougher Flotation Machines. See for yourself in your own mill what they will do for you.

DENVER EQUIPMENT CO.

1400-17th STREET

DENVER 17, COLORADO

Phone Denver CHerry 4466

. . . Over 25 years of Flotation Engineering

Denver Disc Filters

Denver Reagent Feeders

Denver Standard Dryers

Denver Ore Feeders

Denver Wilfley Tables

Denver Crushing Rolls

Put it on the tough jobs—

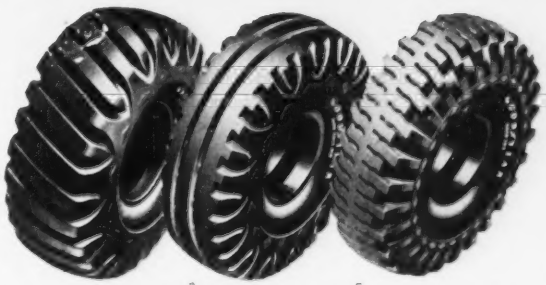
THE HARD ROCK LUG CAN TAKE IT!

FOR rough, tough, off-the-road hauls, you want tires that will keep your trucks moving on schedule with full pay loads—safely, surely, month after month. For such service the Goodyear Hard Rock Lug has no equal.

That's because the Hard Rock Lug is a product of Goodyear's unrivaled experience in building 575 million tires—far more tires for more different specialized uses than any other manufacturer. Look at its features and you'll see why it's the favorite of cost-wise operators. Goodyear, Truck Tire Department, Akron 16, Ohio.

"America Needs Better, Safer Roads—Let's Bring Them Up To PAR."

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!



HARD ROCK LUG
Super-tough champ in all types of tire-killing work. Sidewalls armored by massive lug bars, extra-thick undertread protects extra-thick body. Self-cleaning tread delivers top traction, forward or reverse.

HARD ROCK RIB
Companion tire for front wheels on all tire-killing service. Easier steering, smoother rolling. Same cord body, same shoulder and sidewall as HARD ROCK LUG.

ROAD LUG
High-stamina, dual-purpose tire, best for trucks that operate both ON and OFF the road. Tough construction and special tread design provide super traction off the road—long, smooth mileage on the road.

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

We think you'll like "THE GREATEST STORY EVER TOLD" — every Sunday — ABC Radio Network — THE GOODYEAR TELEVISION PLAYHOUSE — every other Sunday — NBC TV Network

Strips, Clears, Pulls scoop

says veteran Illinois dirtmover about Tournadozer

After 18 years of coal mine stripping and other dirtmoving, Ivan Wright, Peoria, bought his first rubber-tired Tournadozer last year. Now, with more than 2500 hours on this 19 m.p.h. rig, he says, "There's not a crawler-type machine made that will move the amount of dirt Tournadozer will!" For example:

Stripping — On job pictured here, Tournadozer, working alone, stripped 40 ft. of overburden at a small coal mine near Glasford, Illinois. Tournadozer removed all slate and refuse including 1 foot of tough cap rock so that coal had only to be shot and hauled out.

Clearing — Wright assigned 2 dozers to clearing brush and trimming banks for a road. He put a Tournadozer in one ditch and a crawler in another. "Tournadozer walked away from the crawler," he says. "Never found a tree the Tournadozer couldn't take out . . . takes a tree up to a foot in diameter in one pass."

Pulling a scoop—On typical earthmoving, Wright's Tournadozer pulling a 15-yd. scraper averaged 15 trips (150 *pay* yds.) of heavy clay hourly on 400′ cycles, according to time studies made by a Government Engineer. "Working with a scoop," says Wright, "you can load in 2nd gear and dump in 3rd . . . can double production of a crawler-pulled scraper. Tournadozer is the best rig to pull a scoop that I've ever seen or used." Rig has 186 h.p. with 4-wheel drive.

Dozing up steep grades — "Working in 6 to 7′-deep channel," reports Wright, "Tournadozer would come up 3-to-1 slopes with a load whereas crawler *could not* make the slopes with a load." (Tournadozer's constant-mesh transmission lets you change speed under load without loss of vital momentum . . . 186 h.p. and 4-wheel drive give you plenty of power to work up steep, slippery grades.)

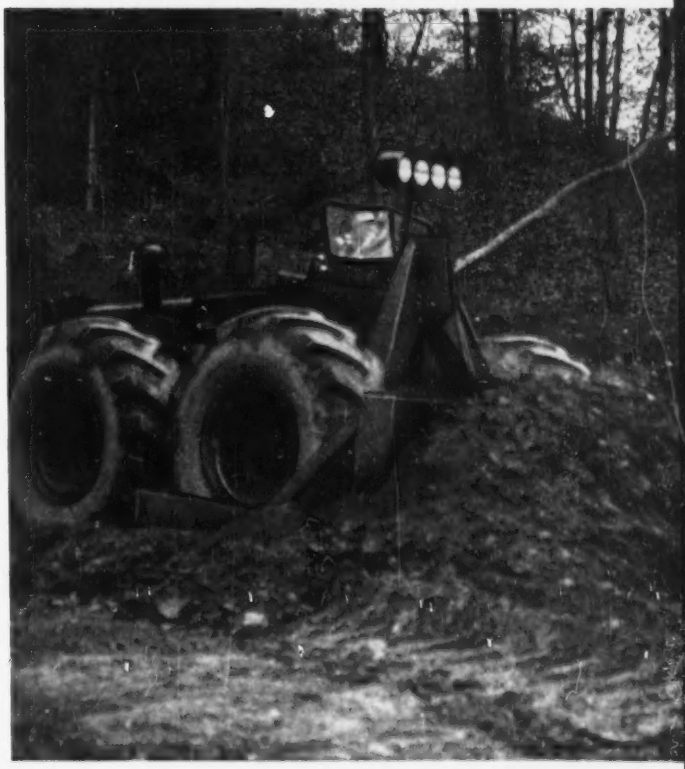
TWICE AS FAST ON 85% OF YOUR DOZING WORK

LETOURNEAU LET EQUIPMENT

Removing overburden at mine near Glasford, Tournadozer, working alone, strips 40 ft. of clay, sand, shale and soapstone, moving overburden on average of 200 ft. One foot of cap rock just above coal seam was also removed by Tournadozer, leaving coal ready to shoot and haul out.

faster . . .

After 2500 hours, Tournadozer tires still have about 85% of original tread. During this period, the rig has been 95% mechanically efficient.



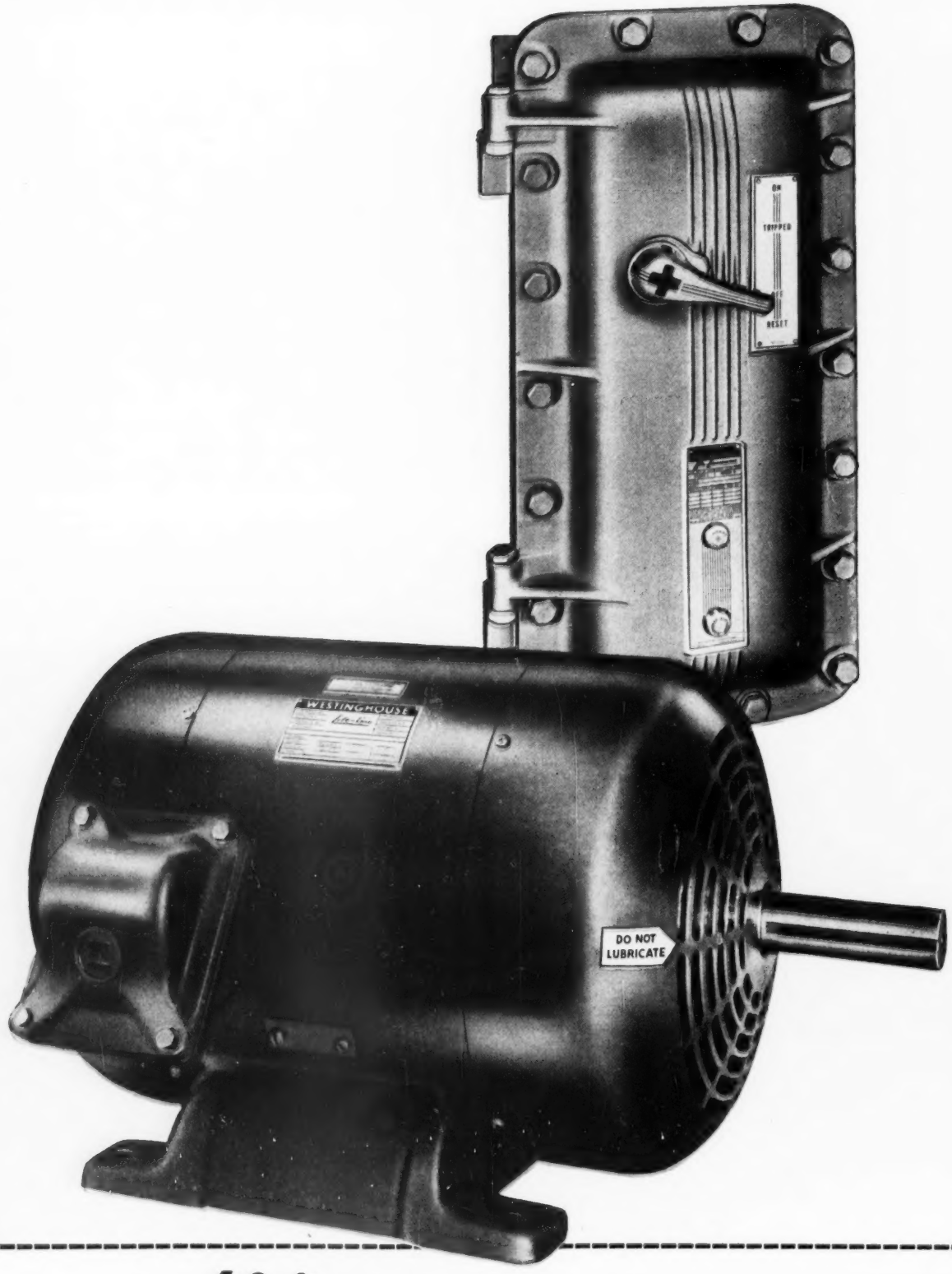
Job-to-job moves — In 2500 hours of scattered assignments, Tournadozer has never been on a trailer . . . travels any time, anywhere over main roads, under its own power, at speeds to 19 m.p.h. "Up to 50 miles, you can move Tournadozer as fast as you can a crawler with a truck," says Wright. You waste no time loading, blocking . . . save time shuttling between assignments or traveling to neighboring spreads.

Ease of operation — Comparing Tournadozer with crawler rigs, Wright reports, "Tournadozer is much easier to operate—no work to it." No wasted time or effort clutching . . . Tournadozer changes speed *instantly* with movement of speed selector switch. Big 18.00 x 25 low-pressure tires take up many of the shocks of uneven ground . . . save wear and tear on operator as well as machine.

Be your own judge of what Tournadozer can earn on your operations. To help you make estimates, ask your LeTourneau Distributor for owner-verified field reports covering all types of working conditions . . . or have him demonstrate one of these high-speed rigs in your pit. Meanwhile, write direct for bulletin TD-117 describing design and construction.

Tournadozer—Trademark Reg.U.S.Pat.Off. D-145-CM

LETOURNEAU PEORIA, ILLINOIS **TOURNADOZERS**



WHAT *Life-Line* REALLY DELIVERS IS MORE SERVICE...LESS SERVICING

The time to stop explosions is before they start

And here's the equipment to do it

Dual Label Explosion-Proof Motor

In any location where Class II, Group G, or Class I, Group D explosive materials present a hazard, you can operate this Life-Line explosion-proof motor safely. It's underwriter approved for *both* explosive dusts and explosive vapors.

And the Life-Line offers extra protection against outages. Heavy steel construction provides greatest protection against physical damage. Pre-lubricated bearings need no further lubrication . . . eliminate outages due to faulty greasing. Superior winding techniques and insulation reduce electrical failures. Together they add up to longer life . . . less servicing.

For Hazardous Locations—Life-Linestarters®

Specially reinforced, cast enclosures with wide flame seals are available in Class I, Group D. Class II, Groups E, F, G are also available. Bi-metal overload relay protection and AB Circuit Breakers cut down time. In case of fault, no need to remove cover to reset breaker or overload relay mechanism. Service is restored immediately.

Simple design, single operation mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation. Kickout spring assures positive opening. Exclusive "De-ion®" arc quenching plus silver-to-silver contacts eliminates contact filing. Compare any other starter and see why Life-Lines offer more service with less servicing.

Together Life-Line motors and starters offer the food industry a new concept in performance. You get more service on the job . . . less down time and servicing. Ask your Westinghouse representative for complete details on both, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21701-A

YOU CAN BE SURE...IF IT'S Westinghouse

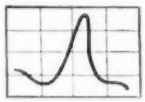
Look at the record –

before you buy a magnetometer survey

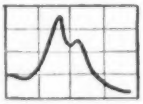
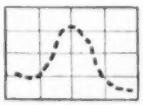
Most magnetometer surveys are flown at speeds of **150 to 200 ft. per second.**

Therefore, you must have split-second response from both the magnetometer and its recorder.

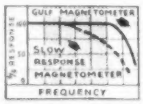
Otherwise the signal is attenuated and dulled, and the magnetic record is rounded off and mushy,

like this: In order to show a peak like this: 

the recorder must be able to sweep rapidly over a range of thousands of gamma. Otherwise, a typical complex figure

like this:  is recorded like this:  The high fidelity **GULF** magnetometer

used by AERO SERVICE CORPORATION, in over 500,000 miles of surveys has a

response curve like this: 

Within the shaded areas are important components of

signals found in most mineral surveys. Some magnetometers fall off badly in this area. But our instrumentation

delivers a *full* record—no mushing or missing great shifts in magnetic intensity. Complex inflections are recorded

fully for our compilation of maps which are literal presentations of complete

data, without "fudging" or editorial construction.

Only with a complete, precise magnetic record can you make valid appraisals of the depth, size and shape of an ore

body. It was proved at

. . . and at

. . . and at other new finds of

magnetite, asbestos, chrome and other minerals. You're paying for the complete record.

Why not get it? Let us explain how the complete magnetic record **which costs no more** can aid your exploration.

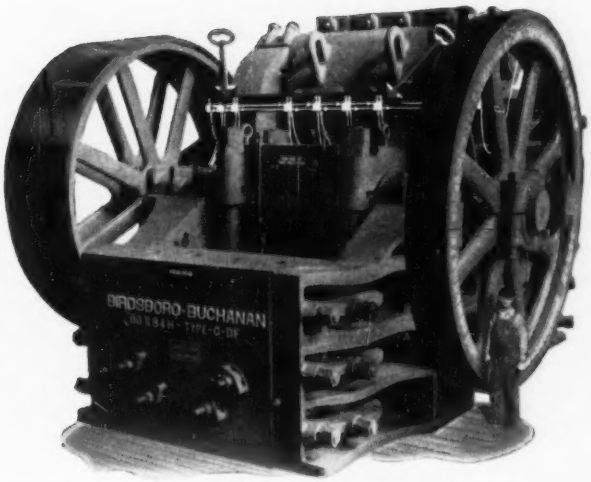
AERO SERVICE CORPORATION

236 E. COURTLAND ST. PHILADELPHIA 20, PA.

OVER 500,000 MILES OF AIRBORNE MAGNETOMETER SURVEYS

FARVAL—*Studies in Centralized Lubrication* No. 133

World's largest deep frame jaw crusher is protected by Farval lubrication



KEYS TO ADEQUATE LUBRICATION—*Wherever you see the sign of Farval—the familiar valve manifolds and dual lubricant lines—you know equipment is properly lubricated. Thus you can see there will be no bearing trouble on this Birdsboro-Buchanan crusher.*

This giant weighs 275 tons, stands 18 feet high, has a 66- x 84-inch jaw opening. It handles feed from a 5-cu.-yd. shovel, discharging a 14-inch product at the rate of 800 t.p.h. It is one of more than fifty thousand industrial machines whose bearings are protected by Farval.

Photo above by courtesy Birdsboro Steel Foundry & Machine Co.

IN the next few months, this mammoth machine will crush three million tons of diorite. Largest deep frame jaw crusher ever built, it is operating on the Detroit dam project in western Oregon.

A highly publicized feature of this project is the cooling of all the aggregates used in the concrete construction. The builder of this crusher insured that the bearings in his equipment would always run cool, too. He equipped it with a Farval Centralized Lubrication System.

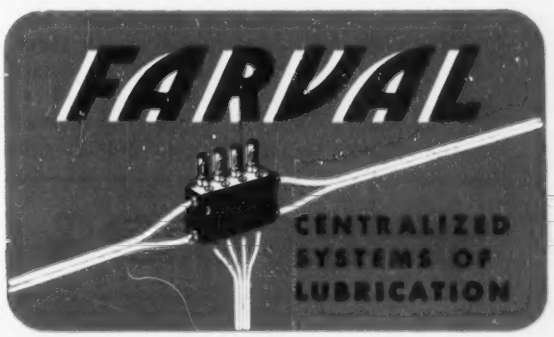
With Farval on the job, no special oilers are needed, lubricant consumption is reduced, bearing life is extended indefinitely and shutdowns for oiling or bearing replacement are eliminated. In short, Farval insures that the crusher can work day in, day out, without interruption from overheated bearings, in doing its part to see that the great Detroit dam is finished according to schedule.

Farval is the original Dualine system of centralized lubrication for industrial equipment, proved practical in 25 years of service. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, the Farval system unfailingly delivers oil or grease to each bearing—as much as you want, exactly measured—as often as desired. Indicators at all bearings show that each valve has functioned.

In or near your city there's a Farval engineer, ready to discuss your lubrication problems and suggest a proper system to meet your particular needs.

The Farval Corporation, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



LATE CITY EDITION

THE EV

VOL. CCXII. NO. 58 WEDNESDAY,

EXTRA!

Insulation Stamina

with

ANHYDREX XX

Where your operations demand exceptional resistance to moisture, ozone, heat, and aging, ANHYDREX XX has the extra insulation stamina that means longer-life and trouble-free service. ANHYDREX XX specially compounded insulation will give you uninterrupted service year in and year out at 2,000-17,000 volts in underground, duct, or aerial installations.

Our research engineers aged ANHYDREX XX for sixteen weeks under the grueling temperature of 250°F. (121°C). ANHYDREX XX retained its excellent electrical properties as well as its rubber-like characteristics. We subjected a vegetable oil compound to the same test and after only one week it lost its rubber-like characteristics. A heat-resistant compound had the same result after three weeks of testing. Both compounds became brittle and when bent cracked and crumbled. There is no better proof anywhere that ANHYDREX XX is tops in high voltage insulation.

The next time you need high voltage cables be sure to specify ANHYDREX XX for economy, quality, and satisfaction. ANHYDREX XX Insulated Cables offer the kind of performance that reduces maintenance and replacement costs. For more complete information about what ANHYDREX XX will do for you, contact your nearest Simplex representative or write in care of the address below.

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney Street
CAMBRIDGE 39, MASS.

Advertisement

Ho
Ho
In

WA
invest
a new
the l
Th
vesti
ment
Jame
it p
ment
FBI
Th
day
(R-I
tor
form
order
leted"
case
Acc
didn
back
Clar
pren
T
prom
perm
spect
C
Ky.)
ing
men
nour
inspe
men

Le
Se
Wi

W
Lew
flan
tod
a ne
out
T
—hi
awai
coal
woul
mand
midni
Le
abo
10-c
men
and
min
wag
Inc
and
for t
try, w
these

Profits keep coming in
when pay loads keep moving out
Choose

MANCHA

Storage Battery Locomotives
They're built to keep going

This Mancha is working in an isolated Canadian gold mine. It has been on the job steadily for the past twelve years.

In isolated locations, where transportation of equipment to and from the mine is difficult and expensive, locomotive breakdowns are especially serious—*trouble-free operation* of prime importance. That's why, in mines hard to reach, you see so many Mancha locomotives on the job. MINE MANAGEMENT AROUND THE WORLD COUNTS ON MANCHA FOR THE *UNINTERRUPTED PERFORMANCE* THAT SPELLS PROFIT.

Will a Mancha Storage Battery Locomotive pay in your mine?

Whether or not you are in the market for new haulage equipment—

YOU CAN HAVE THE ANSWER NOW!

Simply ask for a "data record form." Fill it in and mail it back to us.

The data will enable us to tell you if Mancha locomotives can be profitable for you.

Mail the coupon today, and have valuable haulage information for consideration now, and in the future.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ-153
Send your "data record sheet."

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

"I always choose my Primacord as carefully as I use it . . .

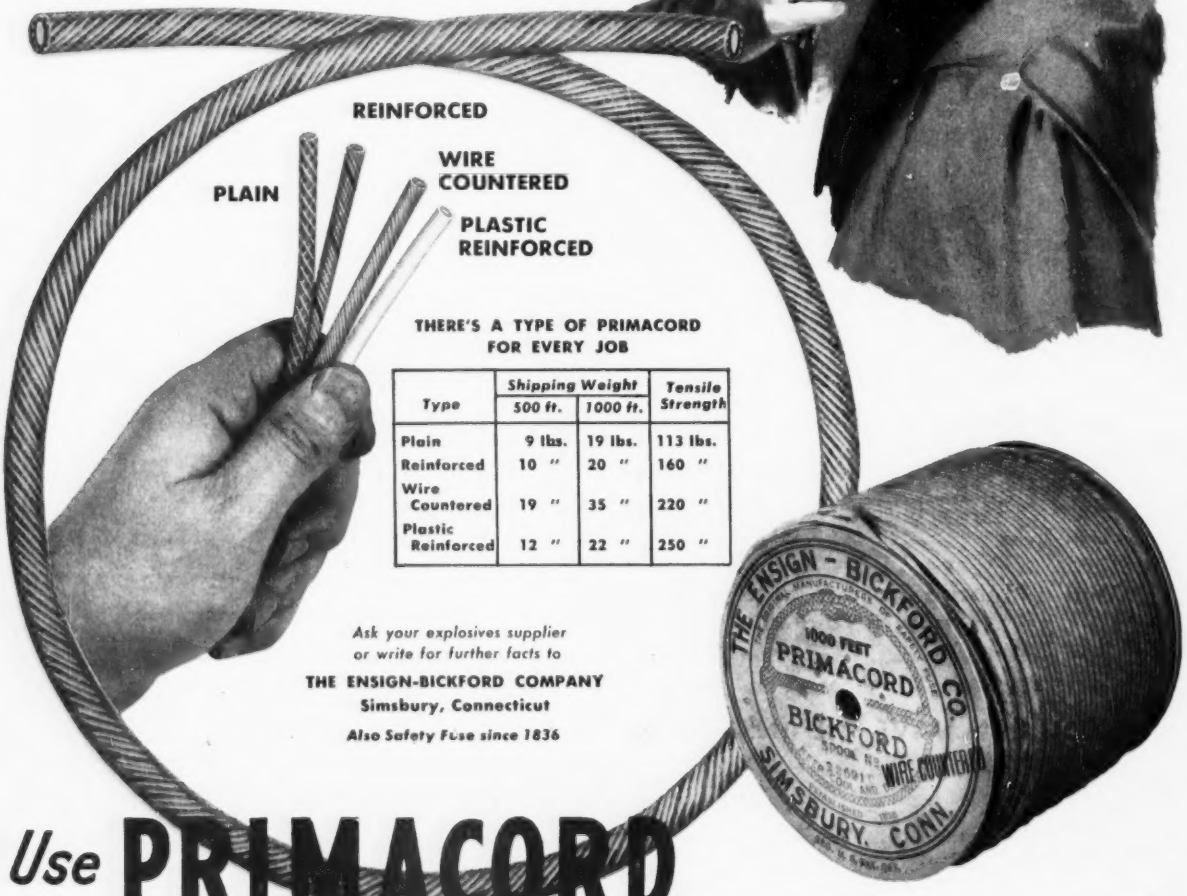
"I've used Primacord to shoot over-burden, ore, rock – and to ditch and clear right-of-way all-over the country. I get good results every time because I choose my Primacord as carefully as I use it.

"Plain Primacord I put down in small-bore or shallow holes, and also use it for the trunk line to hook them up. It's strong, light in weight, and economical. It's easy to tie tight to make a good connection.

"Reinforced Primacord is good insurance where I'm loading deep holes. It'll carry more weight and has a tougher cover to resist abrasion and cutting.

"Wire Countered Primacord is bound with fine wire. I always use it if I think there's any danger of sharp rocks or heavily reinforced explosives containers cutting the Primacord.

"Plastic Reinforced Primacord has a tough, waterproof plastic cover. I've used it in river crossings, in deep holes, or where field shots must stand a long time before blasting. It will take a lot of punishment, and is not affected by high summer heat or winter cold."



THERE'S A TYPE OF PRIMACORD FOR EVERY JOB

Type	Shipping Weight 500 ft.	Shipping Weight 1000 ft.	Tensile Strength
Plain	9 lbs.	19 lbs.	113 lbs.
Reinforced	10 "	20 "	160 "
Wire Countered	19 "	35 "	220 "
Plastic Reinforced	12 "	22 "	250 "

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut

Also Safety Fuse since 1836

Use PRIMACORD®

P-1

The PROVED and APPROVED DETONATING FUSE

LOAD SAND, SNOW, ROCK OR SILT WITH EIMCOS

The Eimco 104 is a heavy-duty machine for handling materials such as rock, sand, gravel or snow. Use it for digging basements, ditches or building roads. For loading trucks in tunnels, quarries or sand and gravel pits.

The Eimco moves forward to load and back to discharge. This straight line movement speeds up the job and reduces maintenance costs.

The Eimco is an ideal tool for heavy-duty loading jobs.

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES – SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES

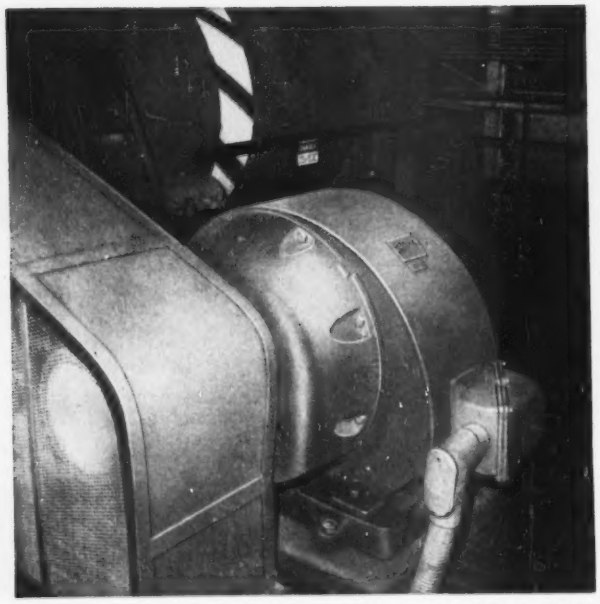
NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE, SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND, EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY, EIMCO ITALIA, S.P.A., MILAN, ITALY

ENGINEERING REPORTS:

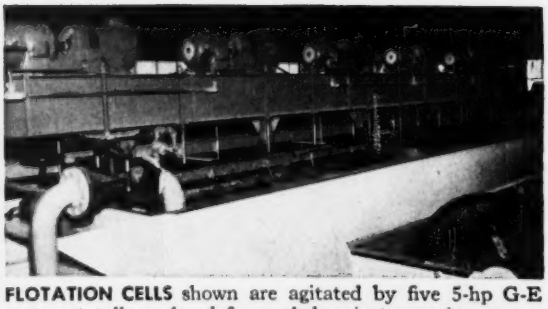
AUTOMATIC MINE HOIST at Duval—amplidyne-controlled and driven by a 600-hp G-E MDP motor—hoists 6 tons of ore up 1628 feet in 103 seconds. Maximum speed is 1100 fpm. Loading, acceleration, deceleration and dumping are all automatic.

Co-ordinated electric equipment

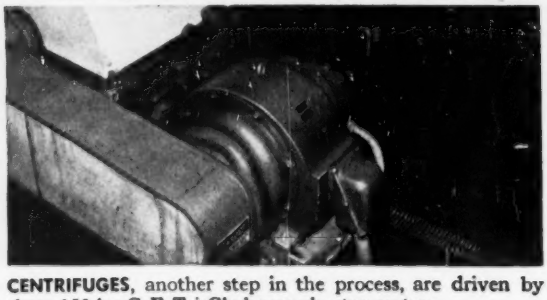


ROD MILL inside refinery is driven at 19 rpm by a 720-rpm G-E Tri-Clad* synchronous motor rated 250 hp, 440 volts.

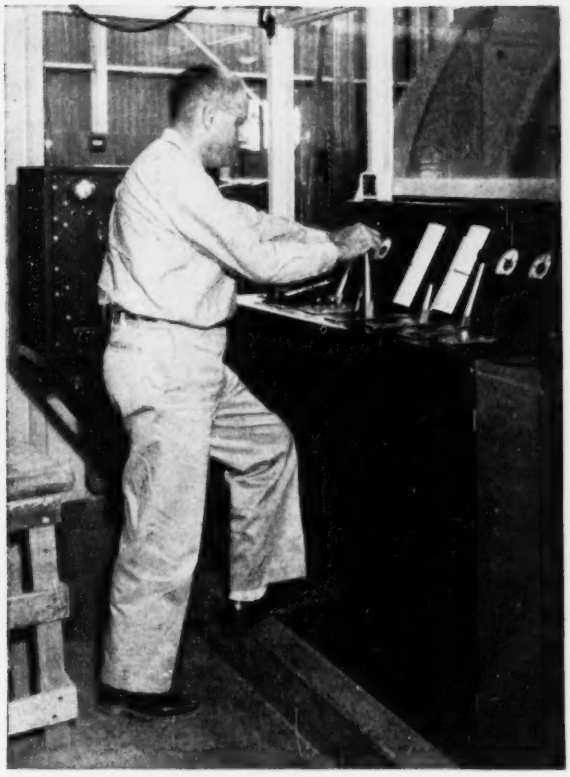
*Registered Trade-mark of General Electric Company.



FLOTATION CELLS shown are agitated by five 5-hp G-E motors, totally enclosed, fan-cooled against corrosive vapors.

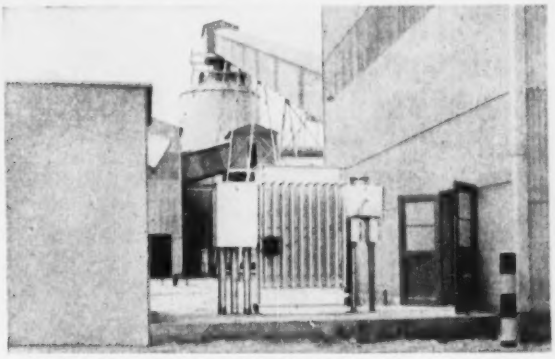


CENTRIFUGES, another step in the process, are driven by these 150-hp G-E Tri-Clad wound-rotor motors.



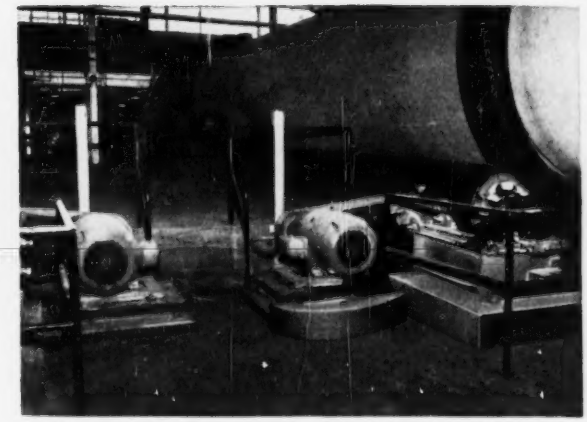
CONTROL OF MAIN ORE HOIST can also be manual by means of master control located in this hoist console.

POWER purchased by Duval is stepped down from 67,000 to 4160 volts at this G-E 5000-kva master unit substation.



DEPENDABLE G-E TRANSFORMERS step down 4160 volts to 480/277 volts grounded-neutral at 6 utilization areas.

keeps Duval potash output high



DRYING KILNS, where the refined potash is prepared for shipment, are driven by 40-hp G-E totally enclosed motors.

System engineered for efficient operation of automatic hoist and refinery drives

Typical of the way General Electric helps mining companies handle high tonnages at low cost is the new potash mine and refinery of the Duval Sulphur and Potash Company at Carlsbad, N. M. General Electric supplied power transformation equipment, refinery motors, and mine-hoist electric equipment.

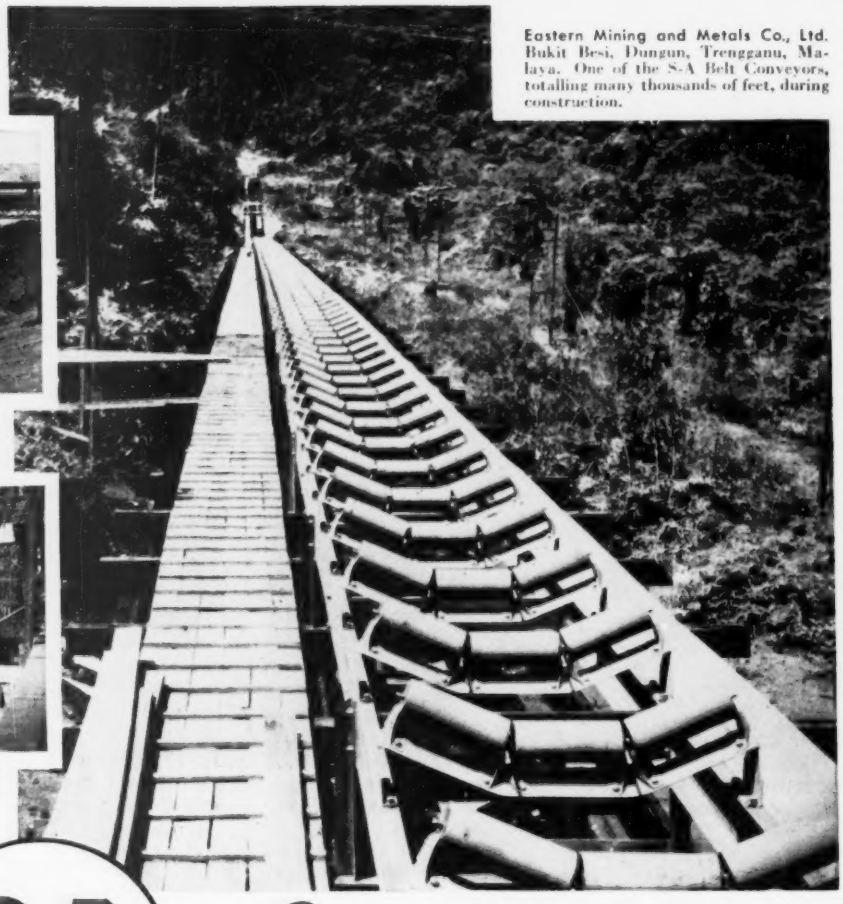
G-E engineers—working closely with engineers of Duval Sulphur and Potash Co. and their engineering contractors, Stearns-Roger Mfg. Co.—applied this co-ordinated drive equipment to meet Duval's needs most efficiently and economically.

To put this kind of engineering leadership to work on *your* ore mining or processing problems, contact your local G-E Apparatus Sales Office—early in your planning. General Electric Co., Schenectady 5, N. Y.

660-27

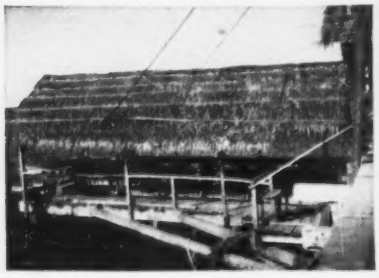
Engineered Electrical Systems for Ore Processing

GENERAL ELECTRIC



Eastern Mining and Metals Co., Ltd. Bukit Besi, Dungun, Trengganu, Malaya. One of the S-A Belt Conveyors, totalling many thousands of feet, during construction.

Surge pile for ore at the end of one belt conveyor prevents lags in shipment. Plate feeders deliver this ore, 500 TPH, to rail cars.



Reversible belt conveyor at head end of pier for loading barges on either side.

S-A CONVEYING Systems move a mountain of iron ore at **BUKIT BESI**

- Belt Conveyors
- Belt, Pan & Plate Feeders
- Ship Loading Boom Conveyors
- Stacking Conveyors
- Storage & Reclaiming Systems
- "Natural Frequency" Vibrating Conveyors
- REDLER Conveyor-Elevators
- ZIPPER Conveyor-Elevators
- Conveyor Belt Cleaners
- Headshaft Holdbacks
- Grizzlies & Screens
- Centrifugal Pilers
- Bin Gates & Tunnel Gates
- Car Pullers & Spotters
- Bucket Elevators
- Skip Hoists
- SEALMASTER Ball Bearing Units

• Write for a bulletin on any of the above

At "Bukit Besi" (Malayan for iron hill) is one of the largest and most modern iron ore operations in the Far East, shipping over 1,000,000 tons annually. Handling this ore and getting it to port 20 miles away is a huge job—made difficult by months of monsoons and a rainfall of 200 inches a year that turns ore into a sticky, viscous mass.

A complete handling set-up, largely engineered and supplied by S-A, keeps the ore moving in an economical and flexible flow that meets all volume and time requirements. Included in this smoothly functioning conveying system are numerous belt conveyors, feeders, car dumpers and other units. Together they provide for conveying and crushing ore, storing and reclaiming, loading and unloading rail cars and selective loading into barges for final shipment . . . all with minimum expense and labor.

Your bulk handling needs may not be as big and complex as this. But whatever they may be, an S-A engineer—drawing on the complete S-A line that is doing the job so well at Bukit Besi—can find an economical answer. Write when we can help you.

STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

WIRE ROPE, too, resists attack with the RIGHT KIND of muscle

Brawny chest and shoulder muscles make the gorilla a formidable foe in the eternal warfare of the jungle. Defending himself and his family, this 450-pound heavyweight stands erect and fights back with sledge-hammer blows of his mighty forearms.

In wire rope, too, it takes the right kind of muscle to resist constant attack of abrasion, corrosion, bending fatigue, load strain and shock stress.

Complete quality control of Wickwire Rope means that you can always count on the right grade of steel and size of wire; the right construction and lay of the rope for best results on your particular job.

See your Wickwire Rope distributor or contact our nearest sales office.

THE COLORADO FUEL AND IRON CORPORATION — Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa

THE CALIFORNIA WIRE CLOTH CORPORATION — Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane

WICKWIRE SPENCER STEEL DIVISION — Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

WICKWIRE ROPE
A CF&I PRODUCT

1221

A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

WICKWIRE ROPE

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

longer service from Tungsten-Carbide Bits

The CP Airleg provides a rigid, well-balanced support for the drill and effectively absorbs all recoil. A CP ratchet throttle (exclusive) maintains balanced feed leg pressure and keeps the bit in constant contact with the rock. This fine balance of feed pressure prevents "slapping," and minimizes the danger of fracturing tungsten-carbide bits.

Available in 1 7/8" and 2 1/8" feed cylinder diameters, and with 36" and 48" feed travel, the Airleg is ideal for use with CP Sinkers, particularly the general utility, 45 lb. class CP-32 and the 55 lb. class CP-59.

Write for detailed information.

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

Fiftieth ANNIVERSARY

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

ROCK RATED!

for the hardest years ahead

Your profits depend on the strength and speed of loading equipment — and P&H gives you more of *both*.

P&H *greater strength* comes from welded alloy steels — the toughest construction known. No wonder P&H can take pounding and shock loads that K.O. less rugged machines.

P&H *greater speed* comes from Magnetorque* Electric Swing — actually 15% to 25% faster than any other machine of its size to give you greater production, lower tonnage costs. And it's goodbye to maintenance and replacement problems for years to come . . . Magnetorque lasts the life of your P&H.

But to get fully acquainted with this outstanding producer, let us direct you to a 955-A in action. If you want bigger capacity, same advanced design, ask about the P&H 1055-A (3½ yd.)

P&H

MAGNETORQUE*

Electric Swing puts you beyond the "clutches of wear"

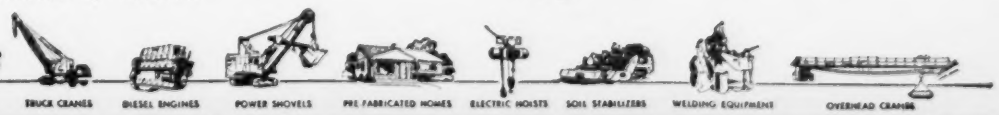
*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER CORPORATION

4400 W. NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

the P&H *Line*



DODGE TAPER-LOCK
SOLID STEEL CONVEYOR PULLEYS

So-o much Simpler!

- The pulley for *modern* belt conveyors.
- Steel hubs with famous Taper-Lock bushing (patented) give equivalent of shrunk-on fit. No "walking" on the shaft. Easy on — Easy off.
- Drum type construction provides maximum strength with minimum weight.
- Accurately formed. Uniform rim thickness. Fully enclosed — to exclude dust, dirt, water.
- Diameters 6 in. to 8 ft., all face widths. Popular sizes stocked by our distributors.

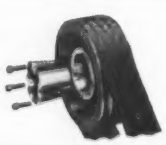
DODGE

of Mishawaka, Ind.

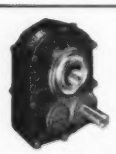
DODGE MANUFACTURING CORPORATION
3100 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

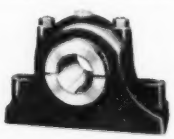
FIRST IN POWER TRANSMISSION MACHINERY!



V-BELTS AND TAPER-LOCK SHEAVES

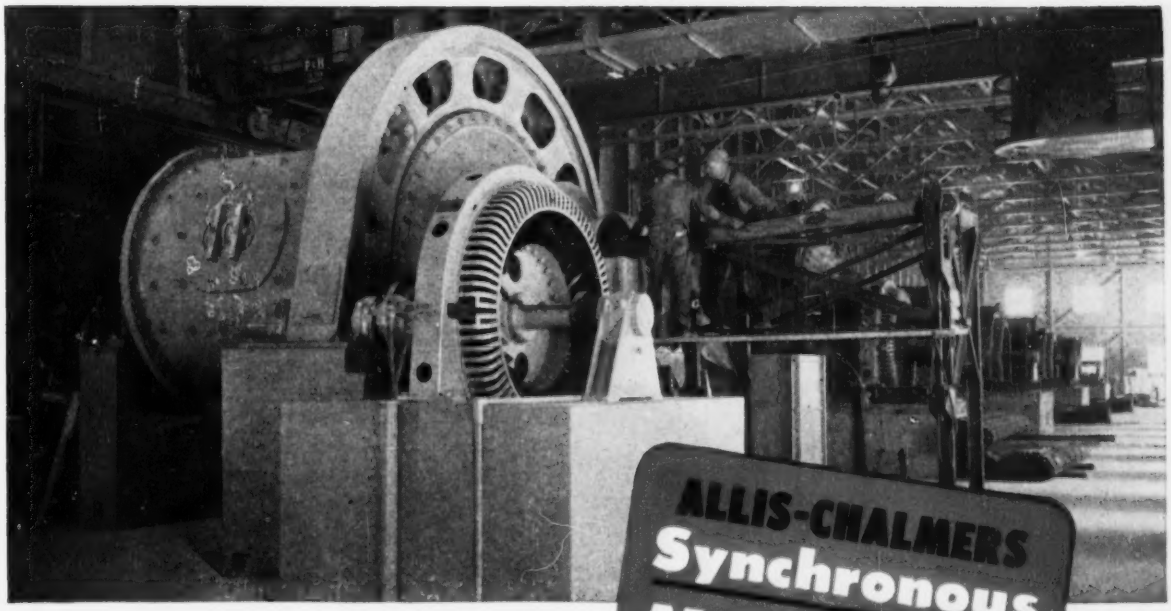


TORQUE-ARM SPEED REDUCERS



DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D CLUTCHES



Five Allis-Chalmers synchronous motors and 9 x 12 rod mills in new midwestern lead ore processing plant. Motors are rated 450 hp, 100% pf, 440 volts, 257 rpm.

Built for a Long Grind

Here are three reasons why Allis-Chalmers grinding mill motors help keep your mills grinding economically year after year:

Each motor is engineered for its job. A-C's half century of experience building electrical equipment *and* processing machinery assures torque and other operating characteristics tailored to the individual installation requirements.

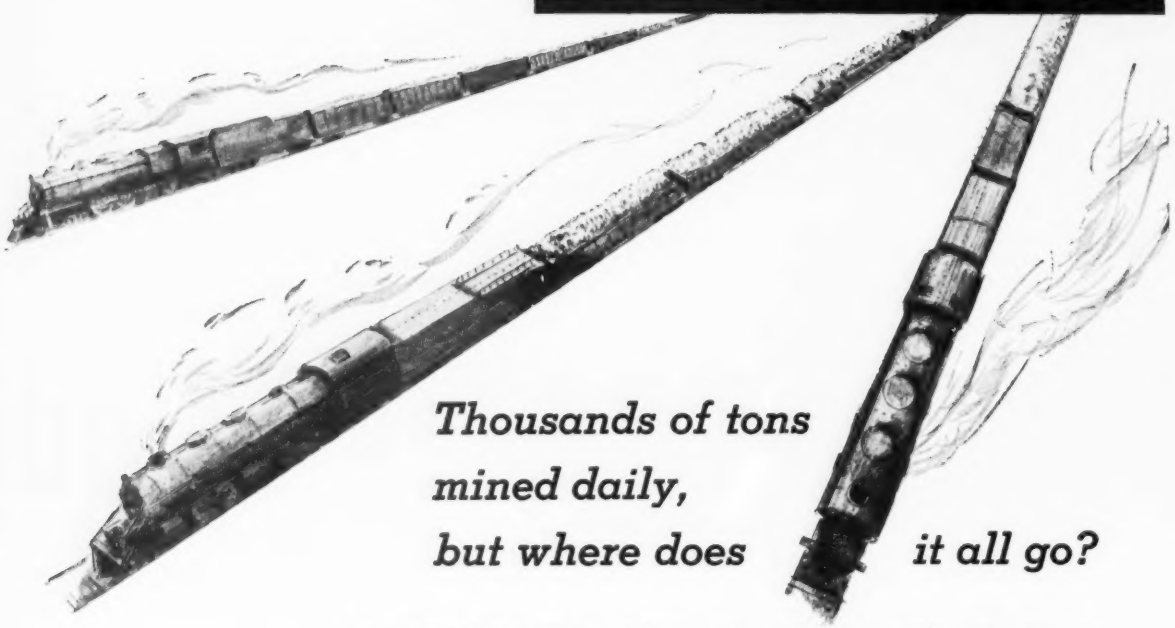
Time-proved basic design features contribute to long life and trouble-free operation. These are described in Bulletin 05B7648.

Adequate manufacturing, inspection and testing facilities insure that each motor will be built exactly as specified.

For more information on motors that minimize maintenance and down-time, call in your A-C representative, or write for illustrated Bulletin 05B7648. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3883

ALLIS-CHALMERS

Sulphur



Thousands of tons mined daily, but where does it all go?

LOOK AROUND YOU and let your glance fall on any object. The chances are 1000 to 1 that sulphur played an important role in its manufacture, either as a component part of the finished product or as a processing element.

Take, for example, the very magazine you are reading. If it's average size it weighs about 1 pound. Made largely of sulphite pulp it required about 0.1 pounds of sulphur in its manufacture.

Multiply this 0.1 pounds of sulphur by the thousands of magazines turned out every day and you'll get some idea of the tremendous tonnage of sulphur required for this *single* division of industry . . . the sulphite pulp manufacture.

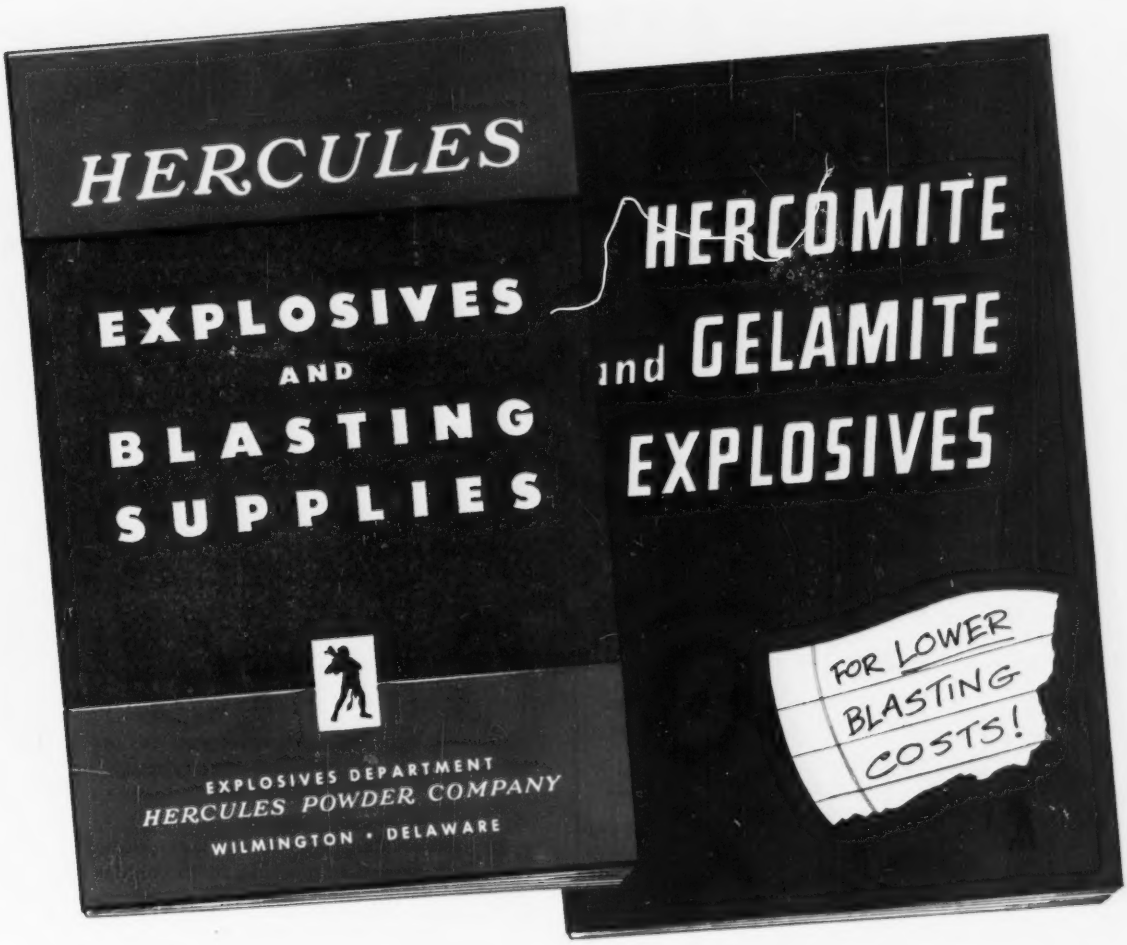
Sulphur has long been called One of the Four Pillars of Industry. Today's need emphasizes this fact more than ever. Sulphur producers are making every effort to get maximum production from existing mines and to develop new sources of sulphur as quickly as possible.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

Explosives Up-To-Date



New Booklets Just Off The Press

Here's the latest information on Hercules' complete line of explosives and blasting supplies . . . a total of 80 pages of valuable data on these products for mining, quarrying, construction, and seismic exploration. If you use explosives in any way, these two new booklets are a "must" for your engineering and purchasing departments. Write for free copies to:

Explosives Department

HERCULES POWDER COMPANY

INCORPORATED

933 King Street, Wilmington 99, Delaware

For Rugged Service Specify GEOPRENE

and be convinced

MAKE THIS *Comparison*

Check these figures, and compare typical Geoprene values with ASTM requirements.

ORIGINAL	ASTM Requirements	Geoprene Typical Values
Tensile strength, lb/sq in.	1800	3000
Percent elongation	300	500
Set in 2-in. test piece, in.	3/8	1/16
After 7 days in Geer oven at 70 C		
Tensile strength, lb/sq in.	1600	2900
Percent elongation	250	430
After 96 hr in oxygen bomb at 70 C		
Tensile strength, lb/sq in.	1600	2800
Per cent elongation	250	430
After 18 hr in oil at 121 C		
Per cent depreciation in tensile strength	40	35
Per cent depreciation in elongation	40	35
Tear Test		
Tensile strength, min lb/in.	40**	75

**This is the requirement for rubber jackets; no tear value has yet been set for neoprene-type jackets.

On the tough jobs—wherever you use portable tools or heavy equipment—specify tough, abrasion-resistant General Electric Geoprene cable. Geoprene's rugged neoprene-based jacket resists oils, acids, alkalies, sunlight, and flame. A tough, corded reinforcing mesh enables it to take the hauling and dragging that your job requires. Specify Geoprene cable. Let it convince you by on-the-job results that G-E Geoprene cable offers extra service, extra tons per dollar.

In the full line of General Electric wires and cables you'll find the cable you need. This famous line includes: G-E No. 1799 varnished-cambric-insulated cable, Super Coronol* cable, wire armored cable, interlocked armor cable, aerial cable, and mine telephone cable . . . Flamenol* control wire and magnet wire.

Send for your free copy of the 24-page booklet, *General Electric Wire and Cable for the Mining Industry*, Section W29-195, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

General Electric Wires and Cables

FOR MORE TONS PER MACHINE PER DAY!

You can put your confidence in—

GENERAL ELECTRIC

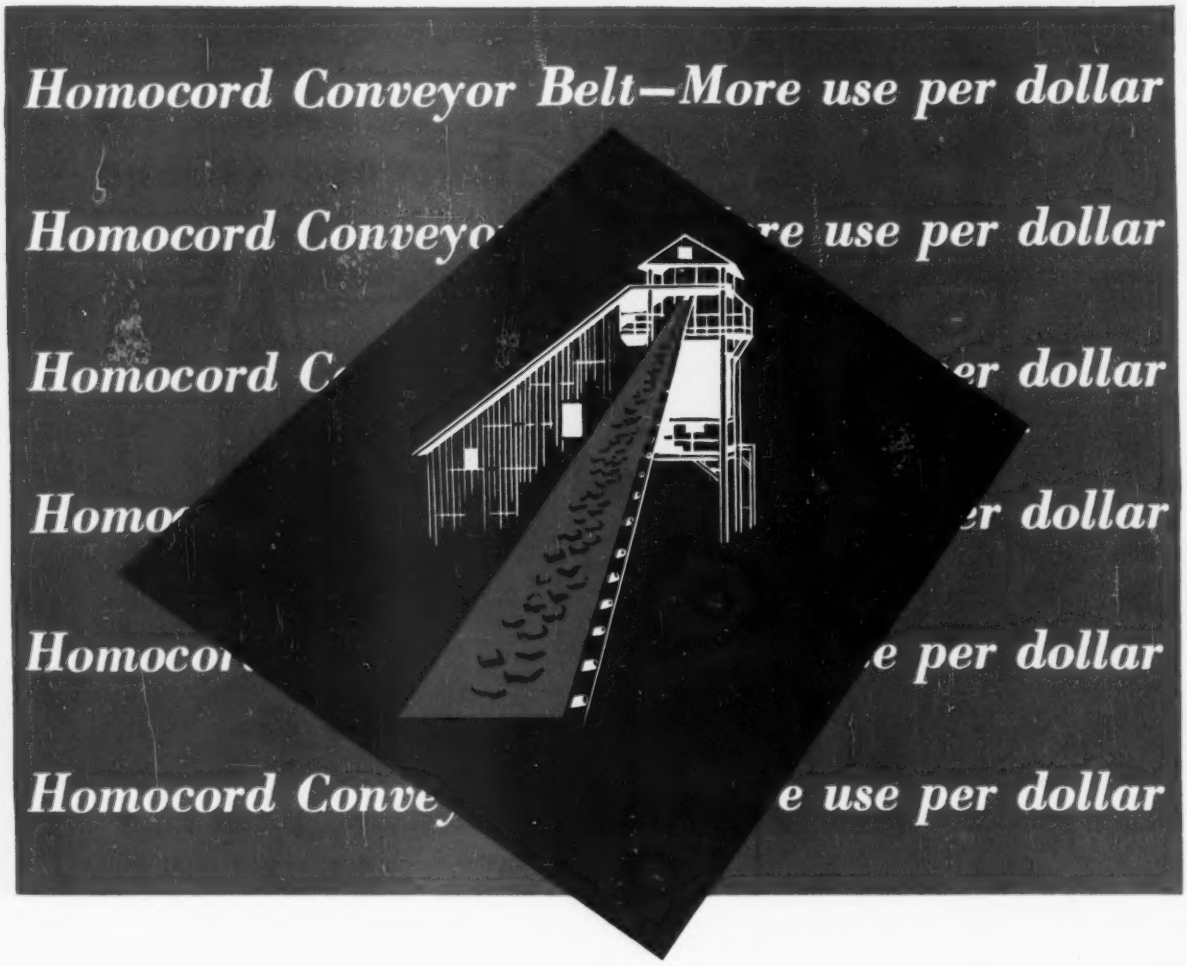
Correct Eastern Standard Time is June 21st 1630 B.C.

From before the dawn of recorded history, man has tried to penetrate the mysteries of time and to measure its flight. At Stonehenge, on Salisbury Plain, England, sun-worshipping Druids set up, 35 centuries ago, what may have been a colossal shadow clock which marked, at least, the semi-annual swing of the sun. When the priest at the altar stone saw the sun rise directly behind the Hele Stone, he knew that the day was June 21st, or, rather, he knew that on this day the sun would cease to swing northward and would, on the morrow, start its retreat to the south. Other stones similarly marked the winter solstice, six months later. This solidly built timepiece is still running just as accurately as it did in the Bronze Age, but its six-month divisions of time are somewhat too broad for today's requirements, when time is so valuable. In the drilling business, Truco Diamond Bits have proved to be great time-savers. Their irresistible cutting power takes them through any formation swiftly, accurately, thriftily, dependably. They are used profitably in every phase of drilling. Have you our Diamond Bit Catalog?

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 6, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

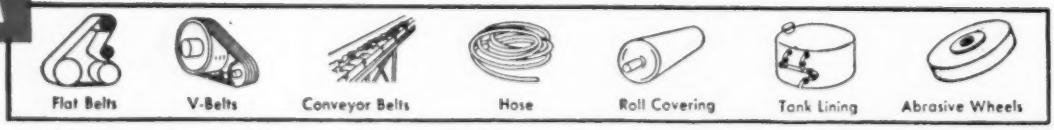

Homocord Conveyor Belt—More use per dollar
Homocord Conveyo re use per dollar
Homocord C er dollar
Homo er dollar
Homoco e per dollar
Homocord Conve e use per dollar

CUSHIONED THROUGH AND THROUGH . . . To take the impact of heavy loading. That's why you get more ton-miles of service out of Homocord Conveyor Belt. This resilience withstands the abrasion and gouging of jagged rock, coal and ore. Its flexibility makes it a naturally deep troughing belt that trains easily on the idlers . . . able to haul heaping loads without edge-wear or spilling. Another R/M Conveyor Belt, Ray-Man "F", is designed for underground mining where pulleys are small and great flexibility and tear resistance are needed. Both of these R/M belts give you long life on the job, MORE USE PER DOLLAR. Ask the R/M distributor for Bulletins 6906 and 6915. R/M field engineers back him up, to give you MORE USE PER DOLLAR—not only in conveyor belts, but in hose, transmission, and V-belts.

RM

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls

Traylor

MACHINERY GOES TO CHUQUICAMATA!

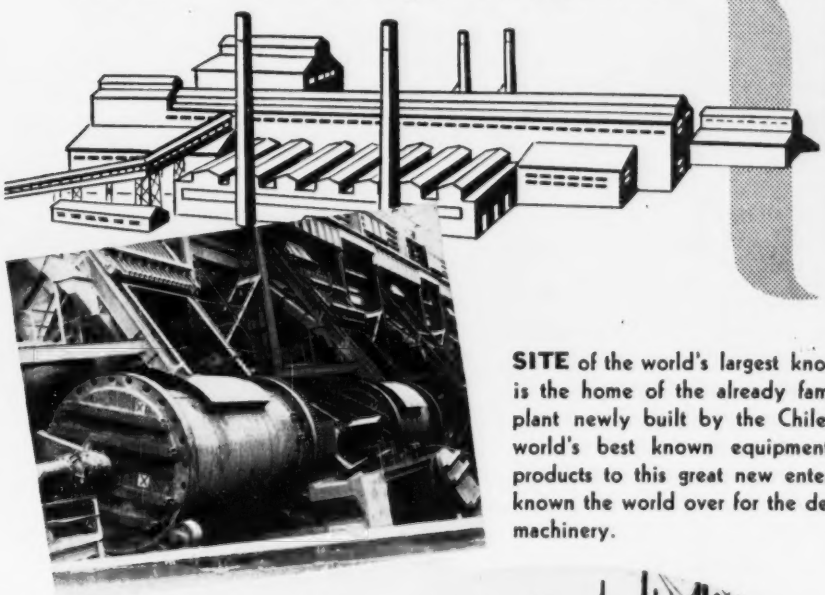
FOUR 13'-0" x 30'-0" Pierce-Smith Converters

ONE 41'-3' Anode Casting Wheel

ONE 10" x 16" Type H Jaw Crusher

ONE 7'-6" x 315'-0" Rotary Kiln

ONE 60" Gyratory Crusher



SITE of the world's largest known copper ore body, "Chuqui" is the home of the already famous 111 million dollar sulphide plant newly built by the Chile Exploration Co. Many of the world's best known equipment manufacturers have sent their products to this great new enterprise. Among them is Traylor, known the world over for the dependable operation of its mining machinery.

For many years, Traylor has supplied the world's leading copper and nickel producers with converters of the Pierce-Smith type in sizes up to 13' x 35'.

Photo shows the new plant going up around a 7'-6" x 315' Traylor Rotary Kiln. This Kiln was specially designed for the job.

Plant's 30,000 Ton Daily Capacity Requires DEPENDABLE Machinery

For 50 years, Traylor engineers have worked with the mining industry, studying its needs and developing advanced equipment to meet its demands. That is why, wherever extreme efficiency is required, Traylor machinery is specified. It takes experience to keep machine designs ahead of production demands. Traylor has experience . . . half a century of it.

Traylor ENGINEERING & MANUFACTURING CO.
512 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfrs. Canadian Vickers, Ltd., Montreal, P. Q.

Fill in . . . . mail coupon for eight page catalog showing Traylor's "Equipment for the Mining Industry".

Name: _____
Position: _____
Company: _____
Address: _____
State: _____

Now . . .

SMOOTH, FAST WORK CYCLE

counts more than ever

and it's yours with the Bucyrus-Erie 38-B

Most Compared . . .

BUCYRUS ERIE

Most Preferred

SPEED is a traditional characteristic of Bucyrus-Erie excavators . . . and speed in the individual dig, swing and dump operations tells only part of the story.

In the Bucyrus-Erie 38-B, working speed starts on the drawing board, where cycle functions are *balanced* with one another (as well as being designed fast in themselves) . . . and coordinated with proper weight distribution. Adding smooth, steady power . . . liberally used anti-friction bearings . . . easy-filling dippers . . . and direct-action mechanical control gives it the overall production speed that has made Bucyrus-Erie the standard of the industry.

Eliminating lost time and waste motion is one *big* way to boost coal production. Now . . . when that counts more than ever before, you can count on Bucyrus-Erie excavators to "deliver the goods." 86E52

BUCYRUS-ERIE CO., South Milwaukee, Wisconsin

This Bucyrus-Erie 38-B's special 2¼-yd. coal-loading dipper is just one of many features designed to help you move more coal . . . faster . . . and at lower cost.

Exide-Ironclad
BATTERIES
ARE YOUR BEST POWER BUY— AT ANY PRICE

They PROVIDE ample power for fast, high-production haulage — more trips per shift, dependable round-the-clock performance, with no end-of-shift slowdown, no unscheduled down time . . . ASSURE inherent safety, with freedom from hazards of fire, fumes, noise . . . SHOW low costs of operation, maintenance, repair, depreciation. SIZES for all makes of battery-powered mine locomotives, trammers, shuttle cars. Call in an Exide representative, and let him prove these facts.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off.*

When the heat is on...

that Pioneer Edge

Pioneer crushers, conveyors feed Southwest's biggest rotary lime kiln

Here, just south of Cleburne, Texas, is one of the world's most remarkable lime-producing plants. With its unique system of preheating and a huge 130 foot rotary kiln, Limestone Products Company is turning out excellent quality lime at surprisingly low cost.

It was natural that the designers of this big, modern plant should choose PIONEER equipment for the important job of keeping it supplied.

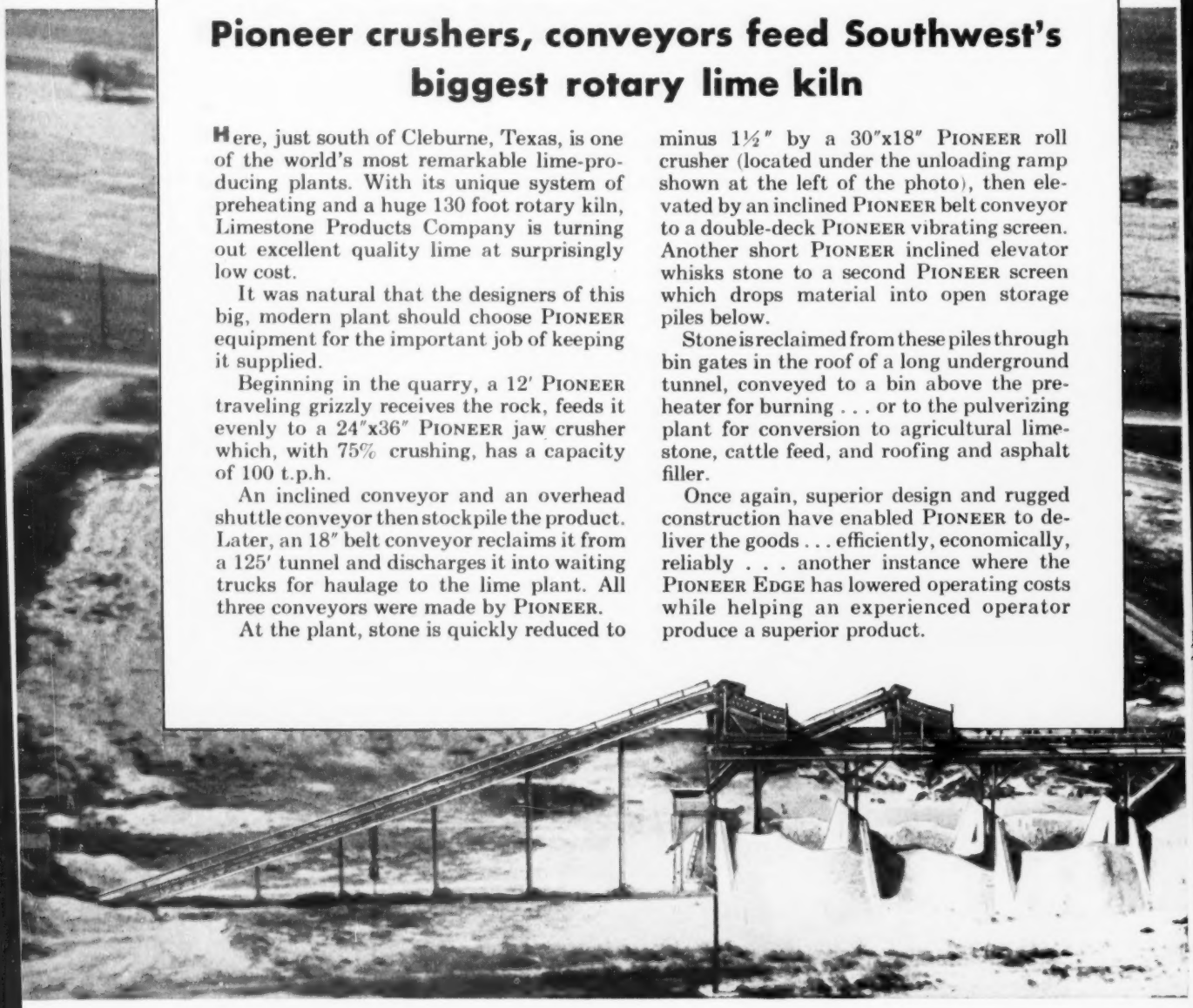
Beginning in the quarry, a 12′ PIONEER traveling grizzly receives the rock, feeds it evenly to a 24″x36″ PIONEER jaw crusher which, with 75% crushing, has a capacity of 100 t.p.h.

An inclined conveyor and an overhead shuttle conveyor then stockpile the product. Later, an 18″ belt conveyor reclaims it from a 125′ tunnel and discharges it into waiting trucks for haulage to the lime plant. All three conveyors were made by PIONEER.

At the plant, stone is quickly reduced to minus 1½″ by a 30″x18″ PIONEER roll crusher (located under the unloading ramp shown at the left of the photo), then elevated by an inclined PIONEER belt conveyor to a double-deck PIONEER vibrating screen. Another short PIONEER inclined elevator whisks stone to a second PIONEER screen which drops material into open storage piles below.

Stone is reclaimed from these piles through bin gates in the roof of a long underground tunnel, conveyed to a bin above the preheater for burning . . . or to the pulverizing plant for conversion to agricultural limestone, cattle feed, and roofing and asphalt filler.

Once again, superior design and rugged construction have enabled PIONEER to deliver the goods . . . efficiently, economically, reliably . . . another instance where the PIONEER EDGE has lowered operating costs while helping an experienced operator produce a superior product.

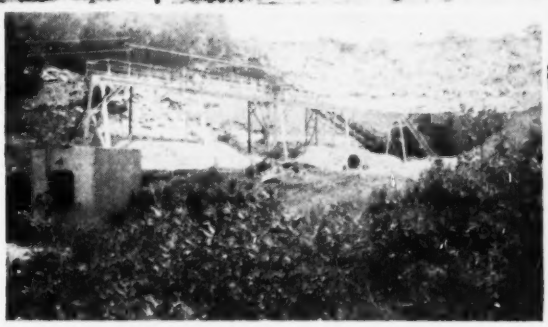


BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo **EQUIPMENT**

delivers lime on time



Source of limestone is this quarry, located 16 miles from the Cleburne lime plant. Here the stone is crushed, stockpiled, reclaimed, then loaded into trucks at the tunnel mouth shown at left.

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

• Please send information on the equipment checked.

☐ GRAVEL PLANTS	☐ BITUMINOUS PLANTS
☐ ROCK PLANTS	☐ APRON FEEDERS
☐ JAW CRUSHERS	☐ MECHANICAL FEEDERS
☐ ROLL CRUSHERS	☐ VIBRATING SCREENS
☐ WASHING PLANTS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ ORO FEEDERS	☐ CONTINUFLO CONVEYORS

Name _____

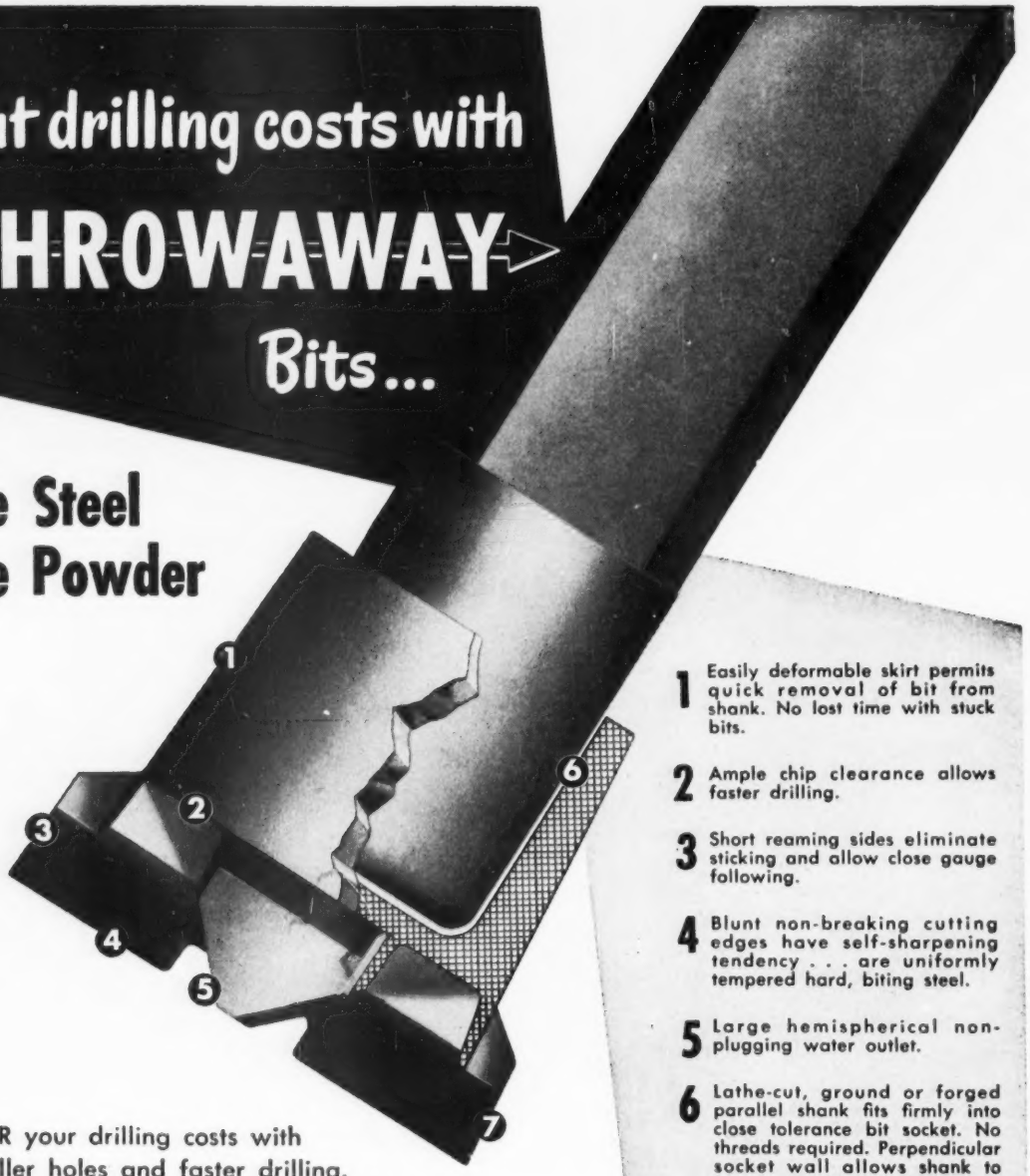
Company _____

Address _____

City _____ *Zone* ____ *State* _____

Cut drilling costs with THROWAWAY Bits...

Save Steel
Save Powder



1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

6 Lathe-cut, ground or forged parallel shank fits firmly into close tolerance bit socket. No threads required. Perpendicular socket wall allows shank to bottom in bit for maximum performance.

7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

THROWAWAY BIT CORPORATION

4200 N. W. YEON AVENUE., PORTLAND, OREGON

BONNE TERRE FARMING & CATTLE CO
Bonne Terre, Missouri

CREATING ENGINEERING
825 1st National Bank Building
Denver, Colorado

GREENAWALT-WHEELOCK & CO.
415 Mills Building
El Paso, Texas

Cut Your V-Belt Costs Right Now!

—this test tells how!

If you want longer V-Belt wear and lower V-Belt costs just make this simple test. Bend any V-Belt that has *straight sides* and—as it bends—*feel* the sides bulge out! (See Fig. 1-A, below)

This out-bulge forces the belt to press unevenly against the V-pulley and of course wear on the belt is concentrated where it bulges most. Naturally this shortens the life of a *straight-sided* V-Belt.

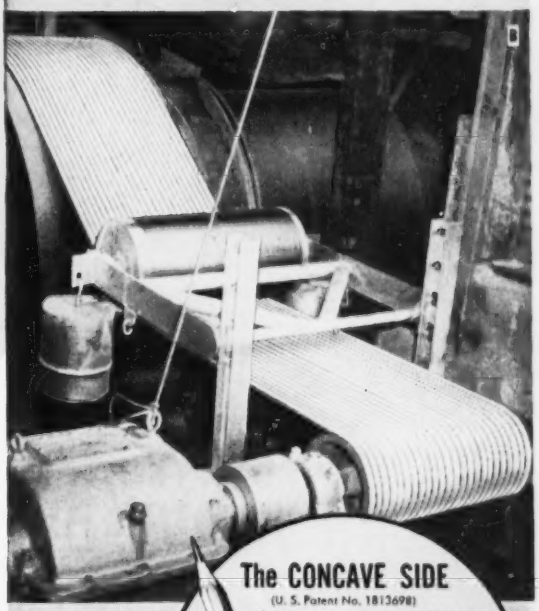
Now, make this same test with the belt that is built with *concave sides*—the Gates Vulco Rope!

See the difference? There is no *out-bulge!* The precisely engineered concave sides *fill out* and become *perfectly straight.* They now *exactly fit* the sheave groove and therefore *press evenly* against the V-pulley. This distributes all wear *uniformly* across the *full width* of the Gates Vulco Rope. And this means longer belt life and *lower belt costs* for you.

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with Concave Sides—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

Silica dust quickly wore out the gear and pinion drive on this sand drying drum. So a Gates man suggested building a flat pulley around the drum (as shown) and running V-Belts on it. Mr. M. D. Pinkerton, plant superintendent, says, "It cost about $4500 to make the change but we are saving about $15 per day without a bit of trouble. The original Gates Vulco Ropes are still good after running every day since September, 1949."

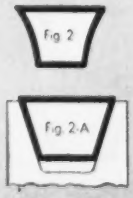


What Happens When a V-Belt Bends

Straight-Sided V-Belt

How a Straight-Sided V-Belt Bulges in the Sheave-Groove. Sides Press Unevenly Against the V-Pulley, Causing Extra Wear at Point Shown by the Arrows.

Gates Vulco Rope With Concave Sides



The Concave Sides Fill Out to Precise Fit in Sheave-Groove. No Side-bulge! Sides Press Evenly Against the V-Pulley —Uniform Wear and Longer Life!

CS-531

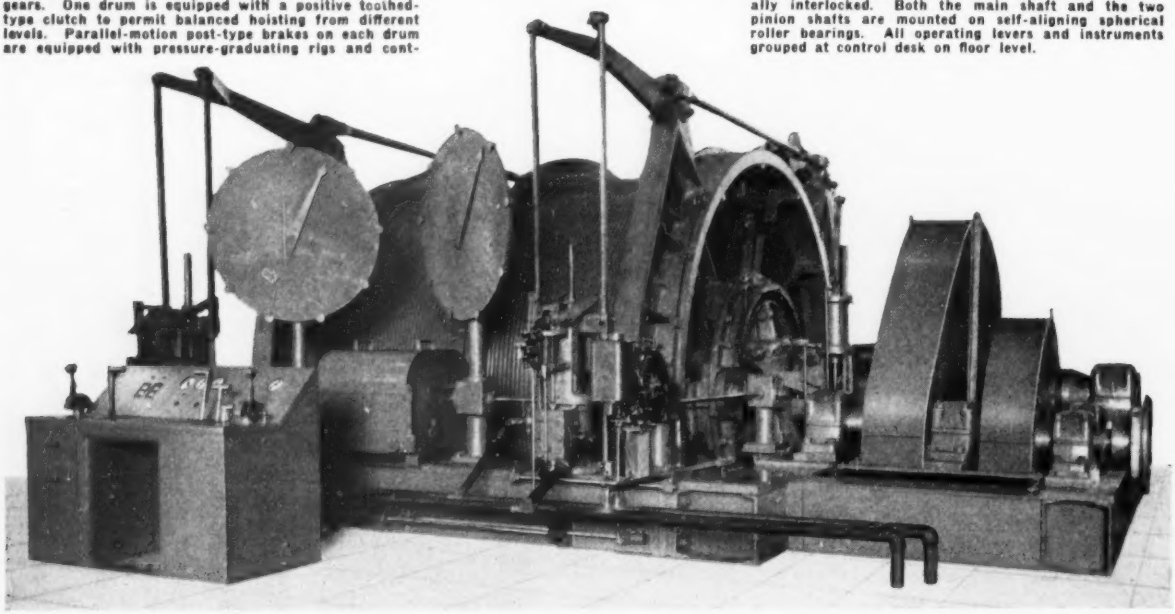
Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose Molded Rubber Goods for industry World's Largest Maker of V-Belts

Shop assembly of very modern shaft hoist recently furnished to a metal mine in Australia. 12'—0" x 51" "built-up" all-steel cylindrical drums will be driven by a 600 hp. direct-current motor, with Ward-Leonard amplidyne control, through double-reduction herringbone gears. One drum is equipped with a positive toothed-type clutch to permit balanced hoisting from different levels. Parallel-motion post-type brakes on each drum are equipped with pressure-graduating rigs and controlled by modern safety devices which include man-safety feature and automatic throttle shut-off which prevents over-speeding at any point of travel. Brakes and clutch are both operated by oil-hydraulic engines and, on the loose drum, are mechanically and electrically interlocked. Both the main shaft and the two pinion shafts are mounted on self-aligning spherical roller bearings. All operating levers and instruments grouped at control desk on floor level.

FOR AUSTRALIA



All Over the World
VULCAN HEAVY-DUTY HOISTING EQUIPMENT

Each of these three bulletins contains a wealth of specific information. Write for free copies if you can use them to advantage. Fully illustrated.

is helping free nations to develop their resources

In this period of international cooperation, when all free nations are striving to increase their ability to resist aggression, we are proud of the important services being rendered by Vulcan engineers and Vulcan products to mining companies throughout the free world.

Coal, Copper, Iron, Lead, Zinc, and many other essential materials are being produced in greater volume today than ever before by the aid of Vulcan Hoists, Sheaves, Cages, Skips, and other heavy-duty hoisting equipment. The modern hoist illustrated and described above is only one of many recently built, or on order, to assure still greater production in the near future.

Write us regarding any present or prospective hoisting requirement. Our engineers welcome opportunities to make helpful suggestions—based on more than a hundred years of successful experience.

Vulcan Iron Works

ESTABLISHED 1849

Cable Address "Vulworks, Wilkes-Barre" **WILKES-BARRE, PA.** New York City Office, 50 Church Street

DESIGNERS AND BUILDERS OF ELECTRIC HOISTS, CAGES, SKIPS, SHEAVES, ETC., CONVEYORS, ROTARY KILNS, DRYERS, ETC., AND ALL TYPES OF MINING LOCOMOTIVES

SEE OUR FOUR-PAGE INSERT IN THE McGRAW-HILL MINING CATALOGUES.

LIMA type ... 2400

Lima Type 2400, equipped with 120 ft. boom, and 6 cu. yd. bucket.

SHOVEL
CRANE
DRAGLINE

FOR
OPEN PIT MINING, QUARRIES and HEAVY CONSTRUCTION

The LIMA Type 2400 is a big, full mechanical clutch type shovel, dragline and crane with a combination of power, speed and stamina that gives complete satisfaction in all classes of work. It has been given the acid test for high output in rock and fast profitable operation in coal or metal mining. You will recognize at a glance, its heavy-duty engineering which means fewer delays on the job. You will like the smooth, efficient power that flows from its big husky diesel engine; the friction free drums and shafts that rotate on anti-friction bearings and the ease of control through air actuated clutches. These advantages and many more all add up to performance that pays off with fewer delays and bigger profits. You will like the Type 2400—6 yd. Shovel, 110 Ton Crane.

Baldwin-Lima-Hamilton Corporation
Construction Equipment Division
Lima, Ohio, U.S.A.

CAPACITIES: Shovels ¾ to 6 cu. yds. Cranes to 110 tons. Draglines, variable

BALDWIN · BLH · LIMA-HAMILTON

OFFICES IN PRINCIPAL CITIES OF THE WORLD

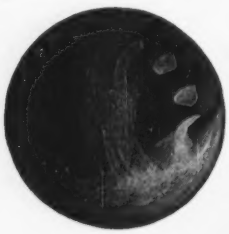
BALDWIN-LIMA-HAMILTON

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • TRUCK CRANES

STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials



RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.

DISCHARGING

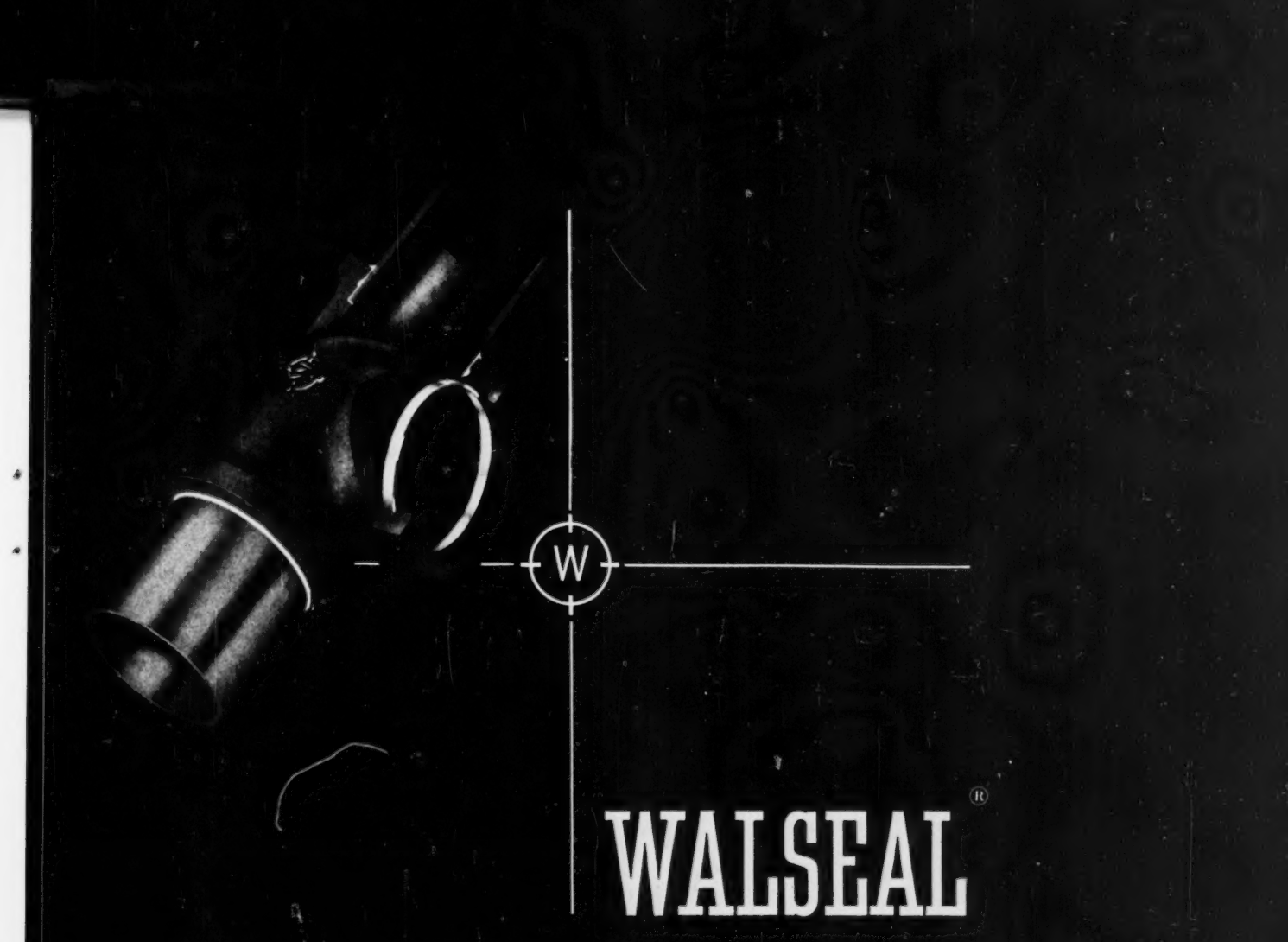
By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

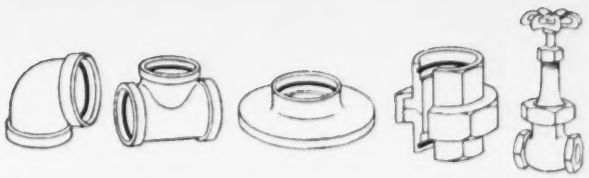
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS



COMPLETE LINES OF WALSEAL VALVES AND FITTINGS

WALSEAL is a smooth-bore, bronze valve or pipe fitting having a **factory-inserted** ring of silver brazing alloy in the outlet or outlets. The brazed joint that results when a Walseal product is installed is leakproof, vibration-proof, and corrosion resistant. The alloy fillet that appears upon completion of the joint is visual assurance of **full penetration of alloy.** This improved method of joining brass, copper, or copper-nickel pipe or tube is another Walworth contribution to the progress of the valve and fittings industries.

In addition to its complete line of Walseal products, the Walworth Company manufactures complete lines of valves, fittings, unions, and flanges in a wide range of sizes and temperature-pressure ratings. The company also makes three lines of pipe wrenches, the Genuine Stillson, Walco, and Parmelee. Walworth products total approximately 50,000 items and are sold through distributors or agents in all parts of the world.



The sectioned Walseal tee illustrated, shows: (a) the fillet of alloy that appears upon completion of the Walseal joint. This fillet is your visual assurance of complete penetration. (b) the factory-inserted ring of silver brazing alloy. (c) sectioned view of the completed Walseal joint showing penetration of alloy both ways from the insert. Walseal joints can be made only with Walseal valves or fittings. For further details regarding Walseal products, ask for Circular 84.

WALWORTH

Manufacturers since 1842

valves . . . fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

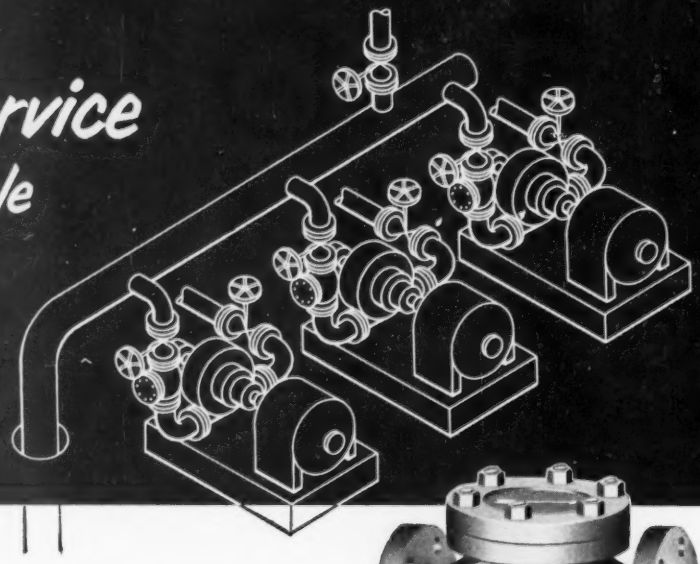
SEE OUR CATALOG IN SWEET'S

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

It's not what you Pay for Valves ....it's what they Cost you

on Water Service
for example

(A Case History)

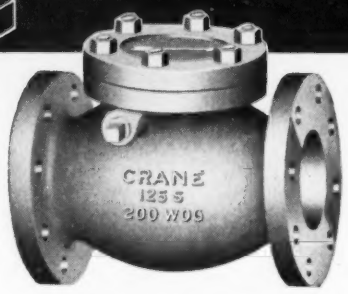


What you pay for valves is not the final criterion of value. Not when maintenance costs can quickly equal or exceed purchase price. And a valve that threatens production is no bargain at any price . . . no attraction to a thrifty buyer.

Take this case in a large eastern paper mill. A single bank of water pumps supplied the entire mill. Leaky check valves at these pumps were a constant problem. Regularly, the checks needed replacement, only to be found leaking between pumping cycles a few months later.

A change-over to Crane Quality Check Valves put a complete stop to this costly maintenance and threat to production. Installed well over a year, Crane checks are protecting the mill against loss of water pressure at no added cost.

Today, more than ever, you need greater assurance of quality in piping materials. You get it in Crane Valves—the recognized standard of quality with thrifty buyers in every industry. Your big Crane Catalog offers complete selections for all needs; your Crane Representative is always at your service.



Crane Check Valves are made in all types, in brass, iron, steel, and alloys. See your Crane Catalog.

CRANE VALVES

Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas.

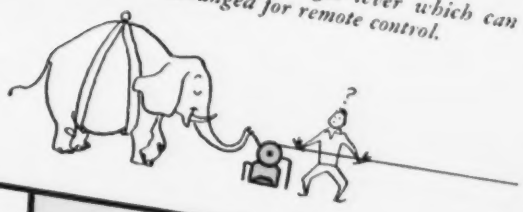
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

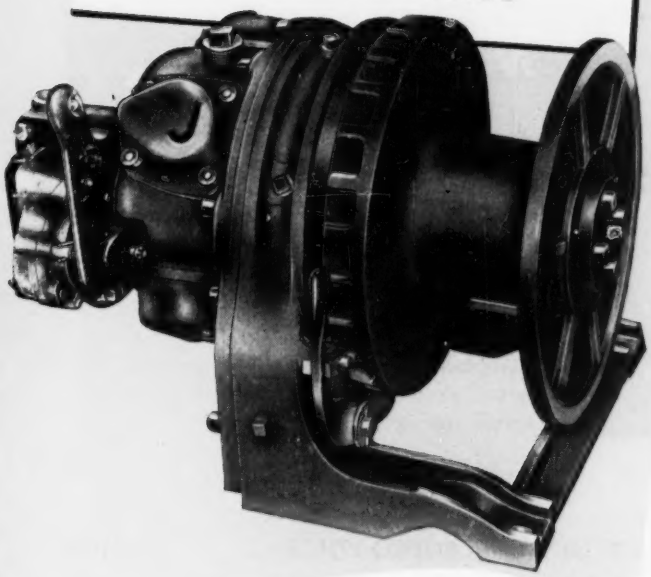
IT'S SAFER . . .

When hand is released from throttle, automatic safety brake stops and holds load stationary.

IT'S SIMPLER . . .

All control is by a single lever which can easily be arranged for remote control.



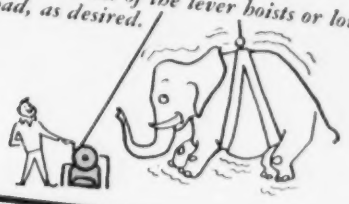


IT'S POWERFUL . . .

1200 lbs. capacity with drum ½ full of rope—
2400 lbs. at first turn of rope on drum.

IT'S REVERSIBLE . . .

Simple movement of the lever hoists or lowers the load, as desired.



. . . IT'S THE NEW

JOY DW-111

"PISTONAIR" HOIST

The new JOY DW-111 "Pistonair" is a powerful, versatile single drum hoist powered by a 4 cylinder, 4 H.P. compressed air motor.

The automatic safety brake is actuated by simply returning the throttle lever to the "off" position. An additional safety factor is the spring return of the throttle lever. If the operator's hand were to slip off the throttle, the lever would instantly spring to "off", actuate the safety brake, and stop and hold the load in any position.

Power plant and gearing mechanism of the DW-111 are totally enclosed. The safety brake is inside the drum, safe from dirt or dripping water.

These and many other features make the Joy DW-111 the *best* single drum hoist of its class on the market. You will agree after you test its power, versatility and accident-preventing safety brake. ● Write for Bulletin 76-X.

Consult a Joy Engineer

OVER 100 YEARS OF ENGINEERING LEADERSHIP

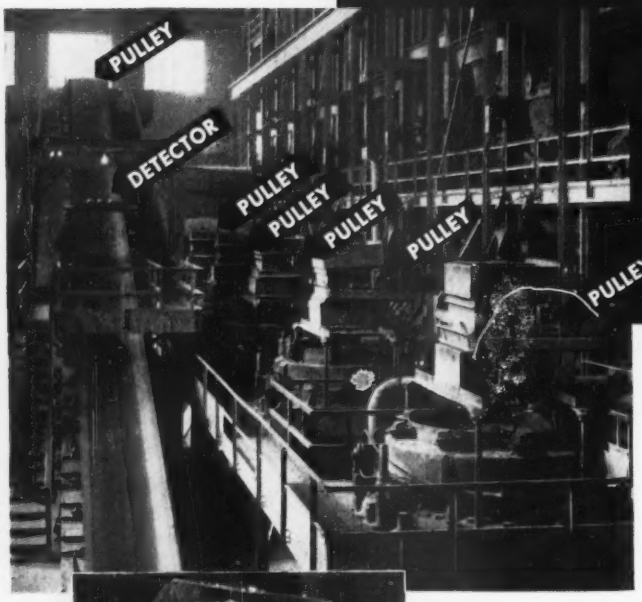
W&D M 4108

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

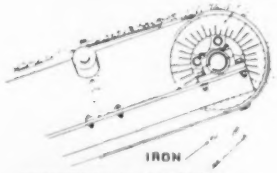
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

TRAMP IRON can't beat the Brains Brawn of this DINGS Iron Detector Magnetic Pulley Team

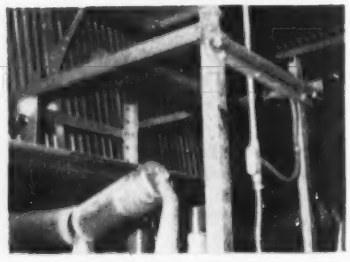


In this ore preparation plant—Quick acting Dings electronic Iron Detector checks main belt burden for large, unwieldy iron rods, rails, chunks—stops belt instantly for their removal. Then Dings Magnetic Pulleys take over the crusher protection job.

DINGS ELECTRO-PULLEY OVER CRUSHER HOPPER



PRINCIPLE OF MAGNETIC PULLEY OPERATION



DINGS IRON DETECTOR

POWERFUL DINGS ELECTRO-PULLEYS . . . give fully automatic iron removal—have virtually unlimited life when given minimum attention. These units have the extra depth of magnetic field, required for heavier belt burdens—but cost very little to operate.

Installation as head pulleys in conveyor systems is usually simple—the Dings pulley shaft is machined to the dimensions of that of the pulley being replaced and the same bearings are used. Little wiring is required.

Dings air-cooled design provides cooler, more economical operation and longer life. Separate section construction plus bronze coil covers make possible the most efficient distribution, greatest penetration of magnetic field. And Dings coil winding process virtually eliminates the possibility of electrical breakdown. Get capacities and dimensions in Catalog C-1001-A.

Alone or in combination Dings Magnets are your best protection against tramp iron—for a look at the complete Dings line send for Catalog C-5000-B.

DINGS MAGNETIC SEPARATOR CO.
4716 W. Electric Ave., Milwaukee 46, Wis.

DINGS RM RECTANGUAR SUSPENDED MAGNETS

DINGS MAGNETIC PULLEYS—ELECTRIC AND NON-ELECTRIC PERMANENT

DINGS NON-ELECTRIC PERMA-DRUMS

DINGS MAGNETS

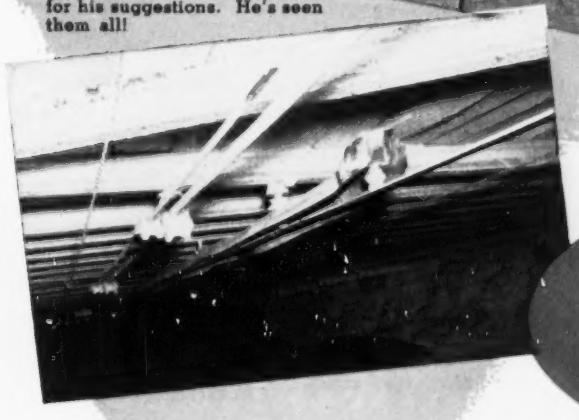
Build Any Overhead with O-B MATERIALS

Any sort of overhead system you choose for new or extended haulage service can be built best with O-B Trolley and Feeder Materials. In fact, many of the O-B fittings work equally well in several types of construction. Whether your mining plan calls for catenary, semi-catenary, or one of the conventional trolley and feeder overheads, you'll find O-B standard fittings ready to do the job. Probably the O-B materials you have in stock can be used for any new type of overhead work you are planning.

Check your No. 27 Catalog, and check with your O-B representative before starting on new overhead. Between the two you're sure to find ways to save time and money!

Outside haulage is well suited to catenary overhead. O-B fittings do the complete job.

Semi-catenary makes a cushioned trolley for smooth current collection. One set of hangers supports both feeder and trolley wire.



O-B Trolley and Feeder Materials combine in any number of conventional overheads. Ask your O-B representative for his suggestions. He's seen them all!

Ohio Brass

MANSFIELD OHIO, U. S. A.

4338 M

Here's how ROCKMASTER® blasting increases explosives efficiency

You can see ROCKMASTER efficiency in these pictures, taken at the height of four different ROCKMASTER blasts. There is no flying rock, no geysering of explosive force. ROCKMASTER keeps the power of the blast confined, using all the explosives energy to produce maximum breakage with maximum efficiency.

When the blast is initiated at the point of maximum confinement, the explosive force follows the line of least resistance . . . directly into the burden. With ROCKMASTER millisecond blasting, the first initiation places the burden under maximum stress, producing lines of weakness throughout the burden. A split-second later, the next charge hits the stressed material with a shattering force that produces maximum breakage . . . maximum use of the explosive force. It is the "one-two punch" applied to blasting.

Ask your Atlas technical representative to show you the picture presentation of the ROCKMASTER story. See for yourself how the millisecond delay electric blasting caps teamed with the ROCKMASTER system of explosives choice can give you greater blasting efficiency through complete confinement of the blast.

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE

Offices in principal cities

NEW UST* Continental Idlers

*** UNIT-SEALED PRE-LUBRICATED TIMKEN BEARINGS**

Saves Grease!
Saves Labor!
Saves Belts!

CGC UNIT-SEALED
CGC PRE-LUBRICATED
CGC TIMKEN BEARINGS

STANDARD DUTY IDLER

Continental's Unit-Sealed "UST" Conveyor Idlers, incorporating Timken Bearings, Garlock Klozures, are the answer to the operator's prayer.

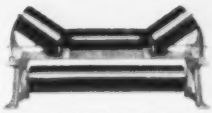
The Unit Bearing Assemblies—"sealed unto themselves" provide an ample but not excessive grease reservoir. This represents a saving of grease and further eliminates any possible migration of the grease from upper to lower bearings on inclined rolls. The lubricant is a top quality water repellent grease of a stable consistency with a wide temperature range for long life.

Most important—this construction permits operating the Continental "UST" Idler without relubrication for 1-2-3 years depending upon the severity or character of conditions.

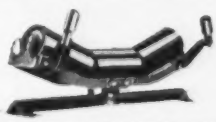
For detailed information on these idlers write for Bulletin EM-116.

SELF-ALIGNING FLAT BELT IDLER

RUBBER DISC IMPACT IDLER



GRAIN CONCENTRATION IDLER



SELF-ALIGNING TROUGHING IDLER

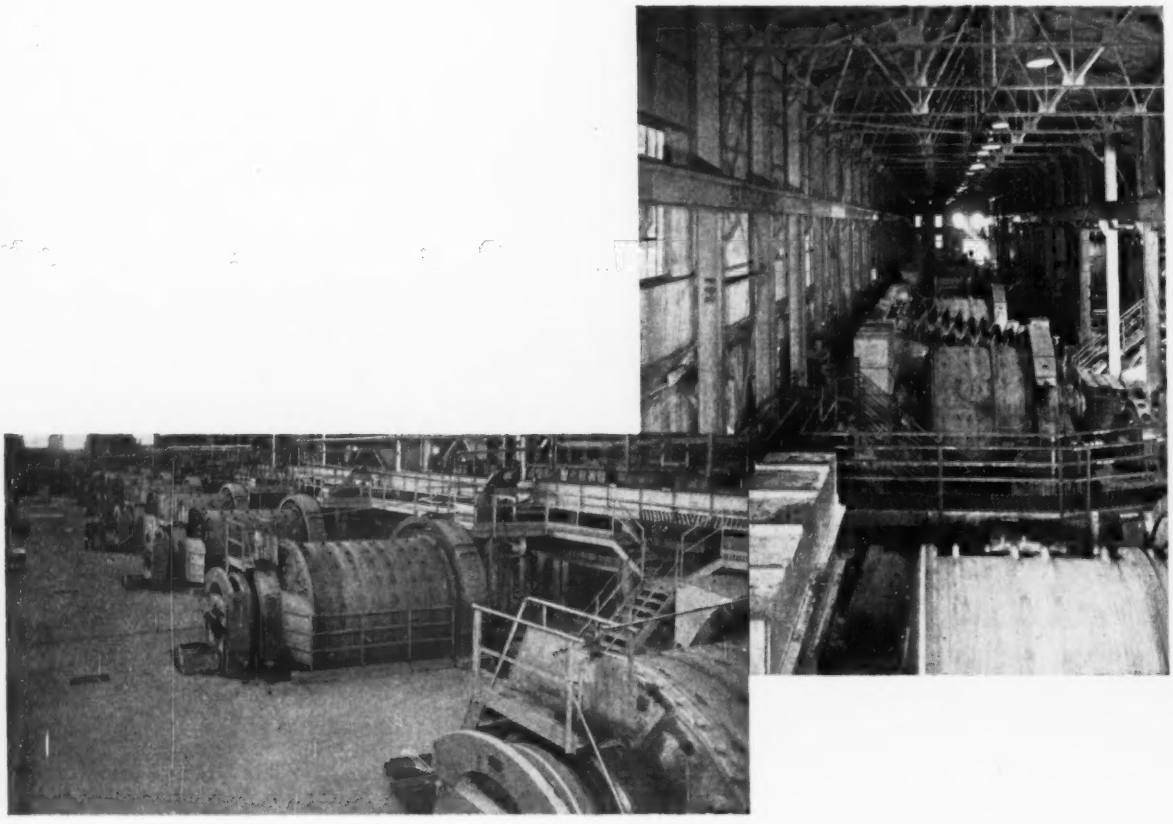
Long Life- THE ULTIMATE IN MINIMUM MAINTENANCE

CG-5209

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

A Cost-cutting • MARCY MILLS



OTHER M&S AND CIW PRODUCTS

MASSCO GRIGSBY RUBBER PINCH VALVES
DENSITY CONTROLLERS

WILFLEY TABLES

LABORATORY CRUSHERS AND PULVERIZERS
SKINNER ROASTERS

MARCY MILLS

Representatives:

Canadian Vickers, Ltd., Montreal, Canada
W. R. Judson, Santiago, Chile
The Edward J. Nell Co., Manila, P. I.
The Austral Otis Eng. Co., Ltd., So. Melbourne, Austr.
Morgardshammars Mek. Verkstads Aktiebolag, Morgardshammar, Sweden
The Ore & Chemical Corporation, 80 Broad Street, New York City 4, New York
Representatives for Continental Europe

AKINS CLASSIFIERS

Licensed Manufacturers:

Canadian Locomotive Co., Ltd., Kingston, Ont., Canada
John Carruthers & Co. (Pty), Ltd., Sydney, Australia
Head, Wrightson & Co., Ltd., Stockton-on-Tees, England
Head, Wrightson & Co., S.A. (Pty.), Ltd., Johannesburg

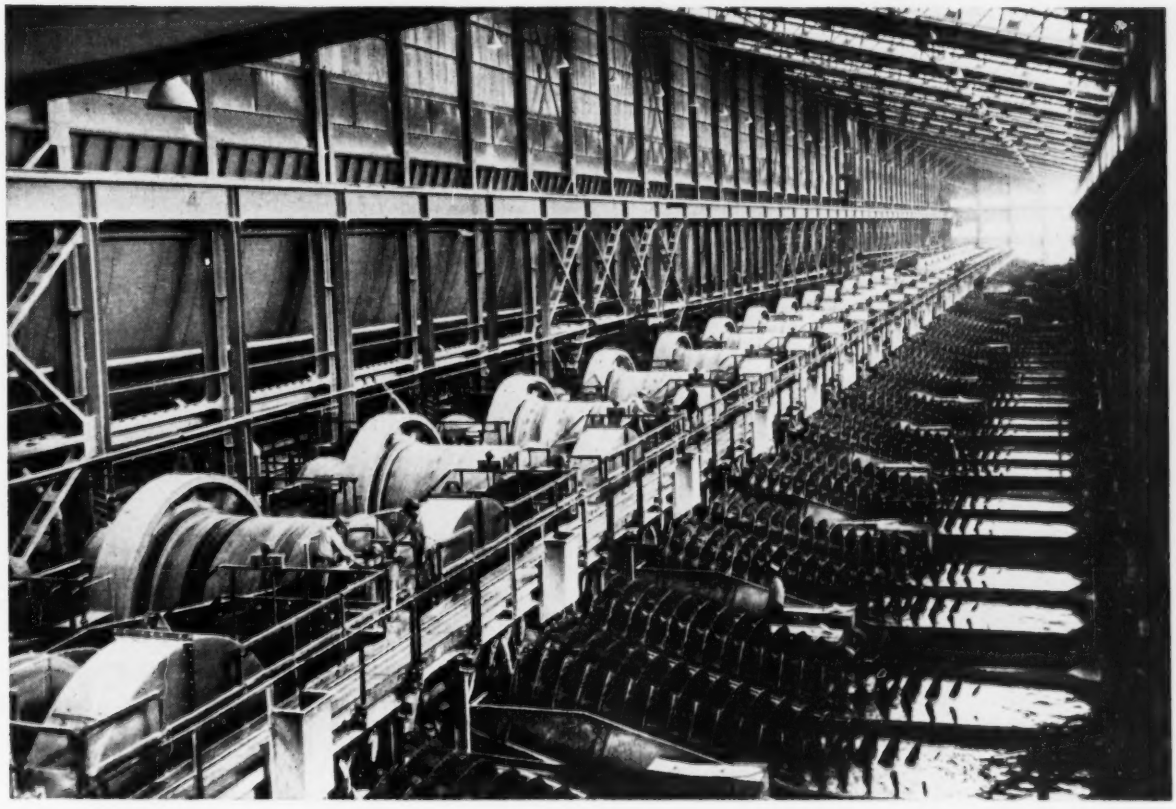
Sales Agents:

Andrews and George Co., Inc., 5 Shiba Park, Tokyo, Japan
Continental Sales and Equipment Co., Hibbing, Minnesota
Edw. J. Nell Co., Manila, P. I.
Wright Bros., Credit Foncier Bldg., Vancouver, B. C., Canada

team

• AKINS CLASSIFIERS

The many successful mining companies thruout the world who continue to place repeat orders for Marcy Ball and Rod Mills and Akins Classifiers prove the low-cost-per-ton performance of these machines.



The Mine & Smelter Supply Co.

Denver 17, Colorado

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

Let our engineers show you the proof... actual operating data for all kinds of grinding and classification problems.

AND ITS SUBSIDIARY COMPANY **COLORADO IRON WORKS**

Denver 2, Colorado

For top belt-conveyor efficiency, top mining men rely on LINK-BELT

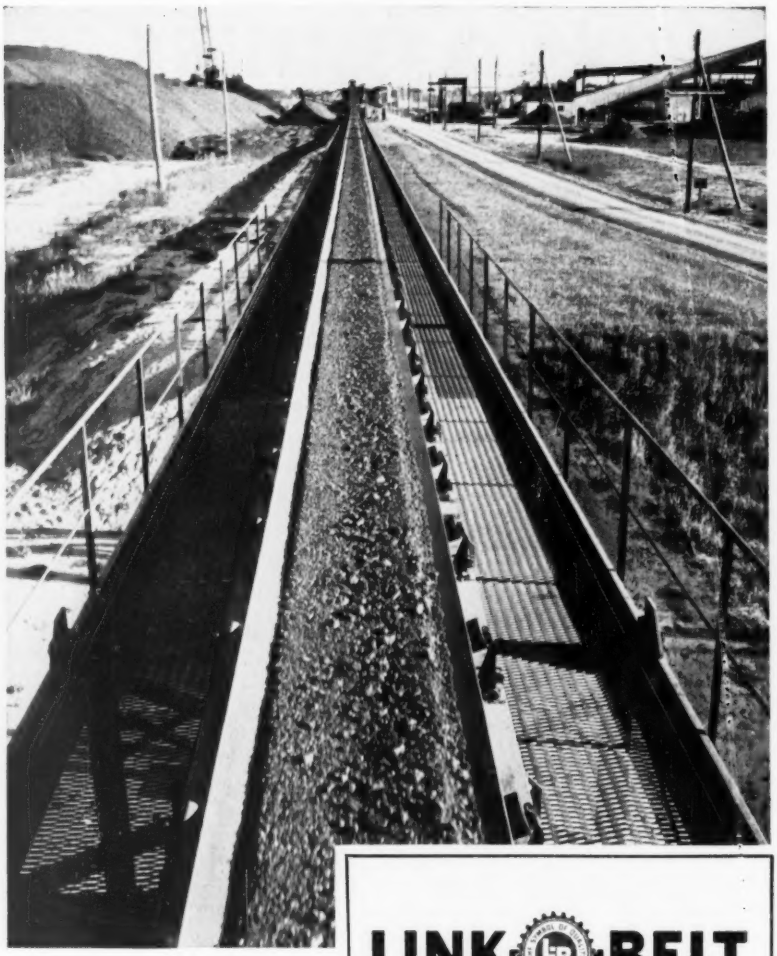
LINK-BELT engineering experience plus quality components combine to cut handling costs

Yes, in mines everywhere, Link-Belt is first choice in belt conveyors. Whether your job is large or small, Link-Belt can apply unequalled engineering experience to meet the conditions of your particular system.

Link-Belt builds a complete line of quality components. Our conveyor engineers can choose from all types and sizes of idlers, trippers and terminal machinery to match your exact requirements.

Link-Belt can also supply all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers. And Link-Belt will build your supporting structures and enclosures . . . install the job completely if desired.

Link-Belt will gladly work with your engineers or consultants. Get in touch with your nearest Link-Belt office.



Ore can be delivered to stockpile at any point along this 940-ft. long L-B belt conveyor by means of motor-propelled tank-type tripper. Or it can pass directly over belt to smelter.

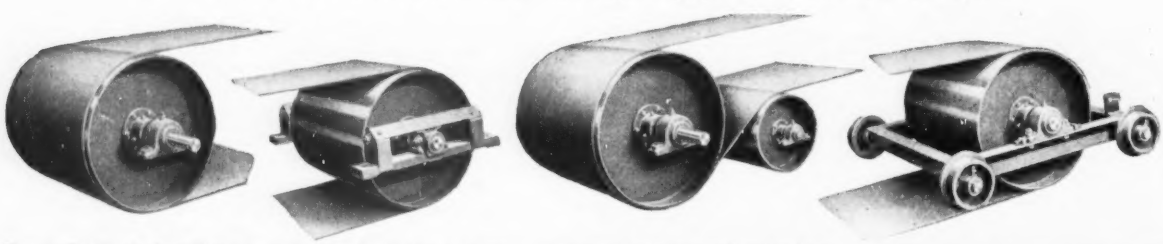
LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Offices in Principal Cities.

12,747-C

LINK-BELT Pre-Selected Terminals—the right equipment for every requirement



Terminal with single pulley drive

Terminal with screw take-up

Terminal with snubbed pulley drive

Terminal with counterweighted take-up

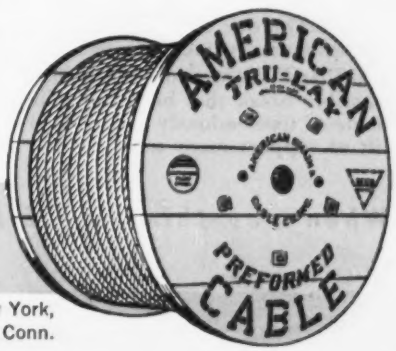
an ACCO product

TRU-LAY Preformed WIRE ROPE

● For each use there is *one best* wire rope . . . one that will stand repeated loading, abrasion, crushing, or continuous bending, and be the best rope to buy.

To achieve this, there is a TRU-LAY Preformed Wire Rope made in a special construction for your equipment. This construction has the exactly right combination of strength, bending life, and resistance to wear and crushing that you need.

The one best wire rope . . . TRU-LAY Preformed . . . will last you longer and cost less to use. Specify and get TRU-LAY Preformed improved plow steel—the rope identified by the Green Strand.



ACCO

TRADE MARK

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

The rope won't suffer long. First the stretch, then the "bang" as it breaks. Tough on the rope—but it gives us vital information!

Check and test . . . check and test

In the making of Bethlehem wire rope, quality control is a fundamental point. It is a factor as basic as proper design; it is the core, the heart, of our careful manufacturing methods.

Throughout this program of quality control, many different tests are employed, for no single test will suffice. The one shown here is an excellent example —one that is cruel to the rope but that yields vital facts.

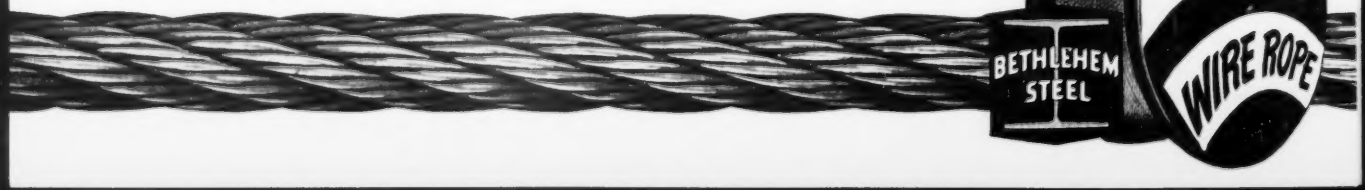
Offhand, you wouldn't think that any machine could possibly break that big, stout Bethlehem rope. It is made of tremendously strong steel wires, and it will lift or support many tons. Yet the machine pictured can break the rope in a matter of seconds. Object: to establish the ultimate tensile strength of the rope.

This rigorous treatment is all part of our overall formula. From open hearth to finished rope, it's check and test, check and test. Nothing is left to chance. Because of this attention to detail, you can depend upon Bethlehem rope to do the job expected.

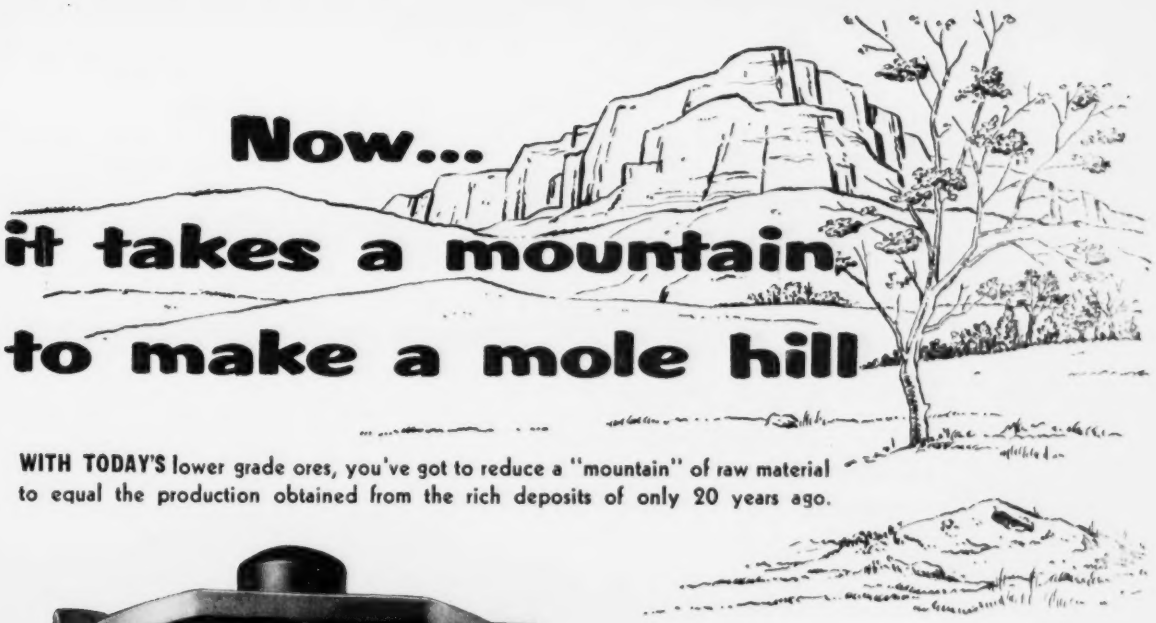
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

When you think WIRE ROPE . . . think BETHLEHEM



Now... it takes a mountain to make a mole hill



WITH TODAY'S lower grade ores, you've got to reduce a "mountain" of raw material to equal the production obtained from the rich deposits of only 20 years ago.

60" TRAYLOR BULLDOG GYRATORY HAS CRUSHED 119,000,000 TONS OF ORE

Look at the production record of one Traylor TC 60" Gyratory Crusher, installed in 1942. Now 10 years old, this TC is still producing 3984 tons per hour of 6" ore. To date, this TC Gyratory has crushed 119 *million* tons of ore. Your slide rule will tell you this Traylor crusher had to work an average of over 8 hours a day, 7 days a week, 52 weeks a year, for 10 consecutive years to make this record . . . which is exactly what it did. Production records like this have been set by Traylor TC Gyratory Crushers all over the world. They will set new production records for you, too. To see how, send for Bulletin 126. It gives complete details of exclusive design features that enable a TC to increase your production *. . . at a profit.* Send for your copy today.

a **Traylor** *leads to greater profits*

TRAYLOR ENGINEERING & MFG. CO.
502 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

MAIL THIS COUPON NOW!

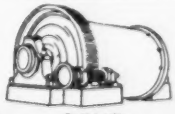
Send me complete facts about the Traylor TC Gyratory. (Bulletin 126)

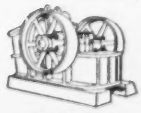
Name: _____
Position: _____
Company: _____
Address: _____ State: _____

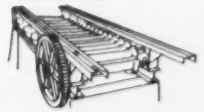
Primary Gyratory Crushers

Rotary Kilns

Secondary Gyratory Crushers

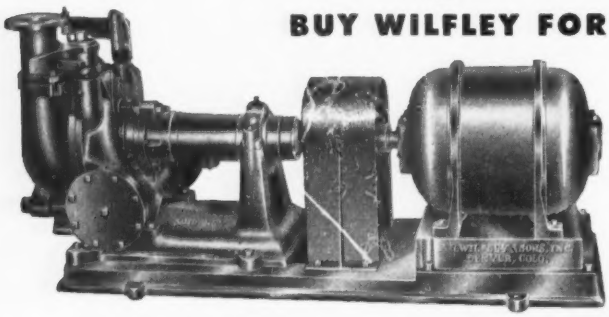

Ball Mills


Jaw Crushers


Apron Feeders

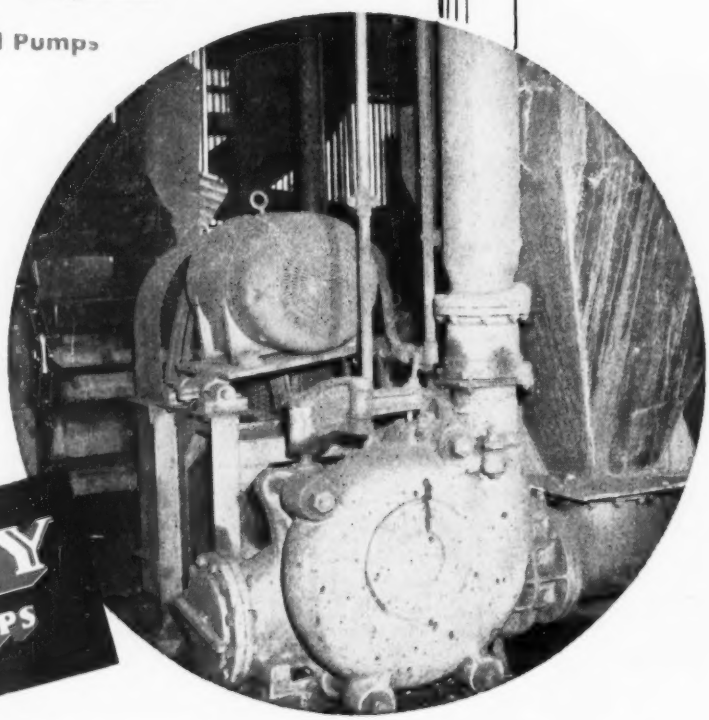
heavy media

BUY WILFLEY FOR COST SAVING PERFORMANCE



Companion to famous Wilfley Acid Pumps

This Wilfley Model K *pump is extremely effective in heavy media circuit and thickener circuit work in coal washing operations. Specifically designed for rugged, heavy duty performance, delivering continuous, trouble-free operation at low cost without media loss, leakage or dilution.*



WILFLEY
centrifugal PUMPS

In modern plants all over the world dependable, highly efficient Wilfley pumps are on the job, operating 'round-the-clock without attention. Available in sizes that meet every pumping requirement. Individual engineering on every application... Write or wire for complete details.

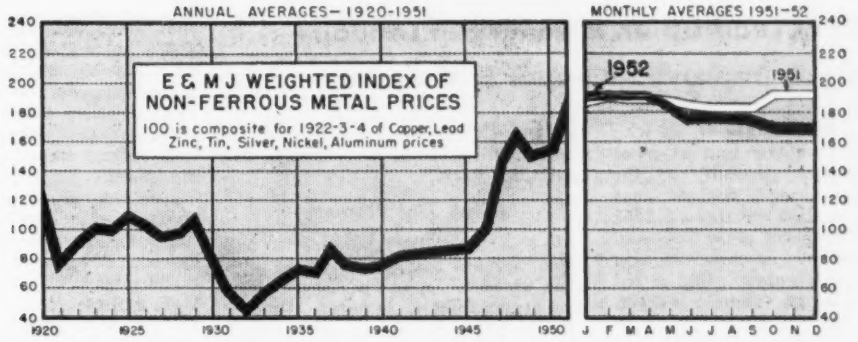
A. R. Wilfley & Sons, Inc.

Denver, Colorado, U. S. A.

New York Office: 1775 Broadway, New York

E&MJ OUTLOOK

PRICES



MARKETS

Blossoming cheerfulness pervaded metal markets as 1952 ended, largely owing to copper's continuing strength, lead's upturn, and the certainty that zinc could not be far behind. Prospect is that strong markets will prevail in 1953 for domestic copper, aluminum, and nickel. Returning strength in lead and zinc should bring moderate rises, and hold them.

Thanks to lead's comeback, following a smart recovery in the London Metal Exchange price, the *E&MJ* index of nonferrous metal prices was off only a fraction for December to 172.00. The November mark was 172.04; the index a year ago was 193.17.

Private trading in zinc on the London Exchange began Jan. 2 at a level even higher than hoped for. The U.S. market promptly began to rise, even before the day was out.

•

LABOR

Settlement of wage agreements between Kennecott and Mine, Mill wound up 1952's mining wage negotiations just about in time for 1953's. Reopening notices can be expected before long, but chances are that wage increases will be a lot harder to get next time.

•

AT HOME

Business in general looks good for at least the first half of 1953, with, at worst, a moderate decline for the last half in prospect. But that doesn't mean booming markets for metals. Barring all-out war, metal markets should hold a much more even keel than they did in 1952.

Government aid to copper mining, on the multi-million dollar scale, is about wound up, although one or two more projects may come through.

At least two U.S. companies are very much interested in a nickel smelting process developed by a French company, and there may be a deal in the making to bring the process to the U.S.

The A.E.C. plans to build a pilot plant, with American Cyanamid's help, to demonstrate cheaper ways of milling Plateau uranium ores.

If the DMPA can line up enough sources of manganese ore in northern Mexico, it may build a processing plant in El Paso to treat these ores.

Inland Steel Co. has been drilling, under option, an iron ore deposit owned by Steep Rock Mines, Ltd. It's reported that a large, very high grade orebody is indicated and Inland is negotiating to take it up. (See p. 135.)

•

ABROAD

Add to list of Peru's new mining projects a joint venture of Utah Construction Co. and Cyprus Mines Corp. They'll open a high grade iron orebody in southern Peru, with first production expected by April, 1953.

It's reliably reported that another joint venture, among French Government agencies, Pennarroya, and the Banque de Paris, will open a copper property in Mauretania, French West Africa. Output is estimated at about 20,000 tons of copper yearly, but it will be all France's.

MARKETS—Trends and Prices

U.S. Price of Lead Up on Recovery in London—Zinc Outlook Improves—Copper Still Active

THE MONTH OF DECEMBER ended with sentiment among buyers and sellers of nonferrous metals generally on the cheerful side. No one doubted that trade over the first quarter of 1953 could be anything but good. The lead price here improved on an advance in London, where speculators had to bid for the metal in an oversold market. Uncertainty over a sharp break in zinc in London almost vanished on assurances from the Ministry of Supply that it intends to do nothing in regard to marketing its surplus that would tend to hamper private trading. World copper prices were easily supported by the continued heavy demands from U.S. consumers. Officials of International Nickel have informed the OPS that the company wants to raise the price of nickel to 60c. a pound. Cadmium was unsettled, selling during the month at prices ranging from $1.50 to $2.00 a pound.

Price Index Steady

The *E&MJ* index of nonferrous metal prices showed little variation, settling at 172.00 for December, against 172.04 in November. A slightly lower monthly average for lead caused the dip.

Taking 1952 as a whole, the price index suffered a loss of 6.83 points, averaging 183.33. This compares with 190.16 in 1951 and 156.42 in 1950. Annual averages were lower in lead, zinc, tin, foreign silver, quicksilver, antimony, and cadmium. OPS refused repeatedly to change its stand on domestic copper, and, as late as Dec. 23, Economic Stabilizer DiSalle declared that suspension of the domestic ceiling price "is out of the question." Foreign copper, involving the bulk of the world's production, averaged almost 5½c. higher in 1952 than in the preceding year.

British Zinc Program

The British plan to relieve the "free" London market in zinc of possible pressure from the sale of surplus stocks follows, in part:

"The Ministry has agreed to sell back to the agents of the United Kingdom and other Commonwealth producers 24,000 tons of zinc of their own brands. This metal will be available for immediate delivery as required throughout the first half of next year. Adequate supplies will therefore be available to meet consumers' requirements. No other zinc from the Ministry's stock will be placed on the market during this period, except for sales by the Government Broker on the London Metal Exchange for prompt delivery when no other prompt supplies are available.

"Pricing of the 24,000 tons of zinc will be on the basis of the monthly average London Metal Exchange quotation over the six months from February to July, 1953, at the rate of 4,000 tons per month. None of this zinc will therefore be priced during the first month of free trading.

"It has been agreed that there will be further discussions between the Ministry and the parties concerned if in the light of experience modification in these arrangements appears to be called for."

As the London Metal Exchange opened on Jan. 2, 1953, the first sale of common zinc was made on the basis of £90 per long ton, equivalent to 11¼c. a pound. At the second call on that day, January zinc settled at £95½ bid and £96 asked, with April at £93½ bid and £94 asked. Initial quotations were about in line with the level of prices obtaining in the European market.

A return to a healthier domestic zinc market is in prospect.

Lead scored a net gain of three-quarters of a cent during December, following the recovery in prices in London. Covering by shorts and disturbing news of a strike at the Port Pirie smelter in Australia were factors. Demand from U.S. consumers on the rise was quite active. The improvement in prices abroad may divert Western Hemisphere lead into channels other than the U.S., which would ease downward pressure on prices here. In the ten months ended October, the United States imported 388,939 tons of refined lead. During all of 1951 imports totaled 178,903 tons.

Labor difficulties again upset pro-

Yearly Average Prices—1948-1952

(E. & M. J. Averages)

	1948	1949	1950	1951	1952
Copper, domestic, f.o.b. refinery	22.038	19.202	21.235	24.200	24.200
Copper, foreign, f.o.b. refinery	22.348	19.421	21.549	26.258	31.746
Lead, common, New York	18.043	15.364	13.296	17.500	16.467
Lead, common, St. Louis	17.843	15.172	13.096	17.300	16.266
Zinc, Prime Western, St. Louis	13.589	12.144	13.866	18.000	16.215
Tin, Straits, New York	99.250	99.336	95.539	127.077	120.473
Silver, foreign, New York	74.361	71.930	74.169	89.368	84.941
Quicksilver (per flask 76-lb.)	$76.489	$79.458	$81.258	$210.125	$199.097
Antimony, N. Y. (cases)	38.168	40.229	30.906	45.666	45.524
Platinum, refined	$86.252	$73.360	$76.556	$90.000	$90.000
Cadmium (producers' quotation)	182.554	200.000	216.840	255.000	224.095
Aluminum, 99 plus percent, ingot	15.733	17.000	17.713	19.000	19.410
Magnesium, ingot	20.500	20.500	22.043	24.500	24.500
Nickel, electrolytic	36.534	40.000	44.792	54.000	56.500

Average Prices for December (E&MJ Quotations)

Copper:

Electrolytic, domestic, refinery 24.200
Electrolytic, export, refinery .. 34.780

Lead:

Common, New York 14.125
Common, St. Louis 13.925

Silver and Sterling Exchange:

Silver, New York, per oz. 83.250
Silver, London, pence per oz. .. 72.577
Sterling Exchange, "Checks" 280.594

Zinc:

Prime Western East St. Louis 12.500

Tin:

New York Straits 121.486
New York, 99% min. .... (e) 120.486

Gold, per oz. U.S. price $35.000
Quicksilver, per flask 214.885
Antimony (E&MJ) (d) 37.970
Antimony, bulk, Laredo 34.500
Antimony, in cases, Laredo . 35.000
Platinum refined, per oz. .. 90.000
Cadmium (a) 180.288
Cadmium (b) 197.644
Cadmium (c) 215.000
Aluminum, 99% plus, ingot . 20.000
Magnesium, ingot 24.500
Nickel (f) 56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

Markets Continued on Page 110

duction schedules in Chile. Braden Copper was down for about two weeks because of a strike. Andes was out of production for a week. Demand for copper has moderated abroad, but continues brisk in this country. Hope of an upward adjustment in the domestic ceiling price after the new administration takes over continues high. Unless Congress extends the legislation that permits the free entry of copper before Feb. 15, 1953, the duty of 2c. a pound becomes effective.

Quicksilver advanced to $218 to $220 per flask on scare buying induced in part by recent estimates of an unusual increase in consumption in 1953.

"Free" Gold Market

Another political crisis in France that cast fresh uncertainty over that country's fiscal policy resulted in increased buying of bars in Paris and moderately higher prices. The Paris market was the center of activity. Pressure of privately minted coins was noted elsewhere.

	COINS		BARS (12.5 kg.)	
	Nov. 29	Dec. 31	Nov. 29	Dec. 31
NEW YORK, transit	....	....	$37.00	$37.60
MANILA	$46.00	$45.50	37.05	37.80
HONG KONG	46.00	46.00	40.15	40.50
BOMBAY	48.25	46.00	43.50	43.00
TANGIER	48.50	47.00	37.10	37.50
BEYROUTH	48.00	46.50	37.15	37.55
PARIS	50.60	51.00	38.30	39.30
BUENOS AIRES	46.50	48.50	39.75	39.75

Major Metals

U. S. DAILY AND AVERAGE PRICES

Dec. 1952	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	24.200	34.925	121.375	14.000	13.800	12.500
2	24.200	34.800	121.375	14.000	13.800	12.500
3	24.200	34.725	121.375	14.000	13.800	12.500
4	24.200	34.675	121.500	14.000	13.800	12.500
5	24.200	35.250	121.500	14.000	13.800	12.500
6	No Market	34.125	121.500	14.000	13.800	12.500
8	24.200	35.350	121.500	14.000	13.800	12.500
9	24.200	35.400	121.500	14.000	13.800	12.500
10	24.200	35.175	121.500	14.000	13.800	12.500
11	24.200	34.375	121.500	14.000	13.800	12.500
12	24.200	34.625	121.500	14.000	13.800	12.500
13	No Market	34.300	121.500	14.000	13.800	12.500
15	24.200	35.025	121.500	14.000	13.800	12.500
16	24.200	34.850	121.500	14.000	13.800	12.500
17	24.200	34.725	121.500	14.000	13.800	12.500
18	24.200	34.725	121.500	14.000	13.800	12.500
19	24.200	34.825	121.500	14.000	13.800	12.500
20	No Market	34.350	121.500	14.000	13.800	12.500
22	24.200	35.000	121.500	14.250	14.050	12.500
23	24.200	34.900	121.500	14.250	14.050	12.500
24	24.200	34.925	121.500	14.250	14.050	12.500
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
26	24.200	34.675	121.500	14.250	14.050	12.500
27	No Market	34.350	121.500	14.250	14.050	12.500
29	24.200	34.675	121.500	14.500	14.300	12.500
30	24.200	35.075	121.500	14.750	14.550	12.500
31	24.200	34.700	121.500	14.750	14.550	12.500
AVERAGES FOR MONTH						
Dec.	24.200	34.780	121.486	14.125	13.925	12.500
AVERAGES FOR WEEK						
Dec.						
3	24.200	34.596	121.375	14.000	13.800	12.500
10	24.200	34.996	121.500	14.000	13.800	12.500
17	24.200	34.650	121.500	14.000	13.800	12.500
24	24.200	34.788	121.500	14.125	13.925	12.500
31	24.200	34.645	121.500	14.500	14.300	12.500
CALENDAR WEEK AVERAGES						
Dec.						
6	24.200	34.750	121.438	14.000	13.800	12.500
13	24.200	34.871	121.500	14.000	13.800	12.500
20	24.200	34.750	121.500	14.000	13.800	12.500
27	24.200	34.730	121.500	14.250	14.050	12.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Dec. 1952	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	280.5000	83.250	72.750d.	248s.	$35.00
2	280.5625	83.250	72.750d.	248s.	35.00
3	280.4375	83.250	72.625d.	248s.	35.00
4	280.3750	83.250	72.625d.	248s.	35.00
5	280.1875	83.250	72.625d.	248s.	35.00
6	(e)	(e)	(e)	(e)	35.00
8	280.2500	83.250	72.500d.	248s.	35.00
9	280.2500	83.250	72.500d.	248s.	35.00
10	280.2500	83.250	72.500d.	248s.	35.00
11	280.6250	83.250	72.500d.	248s.	35.00
12	280.6250	83.250	72.500d.	248s.	35.00
13	(e)	(e)	(e)	(e)	35.00
15	280.6250	83.250	72.500d.	248s.	35.00
16	280.6250	83.250	72.500d.	248s.	35.00
17	280.6250	83.250	72.500d.	248s.	35.00
18	280.6250	83.250	72.500d.	248s.	35.00
19	280.6250	83.250	72.500d.	248s.	35.00
20	(e)	(e)	(e)	(e)	35.00
22	280.8750	83.250	72.500d.	248s.	35.00
23	280.8750	83.250	72.500d.	248s.	35.00
24	280.8750	83.250	72.500d.	248s.	35.00
25	Holiday	Holiday	Holiday	Holiday	Holiday
26	280.7500	Not quoted	Holiday	Holiday	35.00
27	(e)	(e)	(e)	(e)	35.00
29	280.7500	83.250	72.750	248s.	35.00
30	280.7500	83.250	72.750	248s.	35.00
31	281.0000	83.250	72.750	248s.	35.00
AVERAGES FOR MONTH					
Dec.	280.594	83.250	72.577	—	35.00
AVERAGES FOR WEEK					
Dec.					
3	280.422	83.250	—	—	35.00
10	280.263	83.250	—	—	35.00
17	280.625	83.250	—	—	35.00
24	280.775	83.250	—	—	35.00
31	280.813	83.250	—	—	35.00

Calendar Week Averages, New York Silver: Dec. 6th, 83.250; 13th, 83.250; 20th, 83.250; 27th, 83.250.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

There's a lot of enthusiasm on display around W. Jackson and South Dearborn Ave. in the Chicago Loop these days. It's engendered by the congenial group engaged in planning the White Pine copper project. This enthusiasm must be catching because Bob Ramsey, a certified enthusiast in his own right, came back from the midwestern metropolis with a 16-page article on White Pine that easily qualifies as a Herculean Effort. It certainly answers all the questions that any reasonable reader could be expected to ask.

The project is headed up by Harold Ewoldt, an ex-Seabee who in pre-Pearl Harbor days served with the Bureau of Mines. With the Bureau he helped bring in the tungsten mines in North Carolina. He was also known to have come back from field trips with complete reports already written, a practice which must have been quite disconcerting to his colleagues.

Besides the company group which is doing, and has done, a fine job as you will see on pages 72 to 87, White Pine has been helped along by the advice of some of the top men in the mining industry; Ira Joralemon, L. E. Young, Ed Crabtree, Frank Ayer, and Floyd Jardine, to name a few. How can they miss!

Even if you are not going to run out this week-end and do some prospecting with a geiger counter, you'll enjoy Bob Wright's article on page 92. It's one of the most lucid explanations we have seen of the uranium series and assorted phenomena that generally accompanies radioactivity.

It probably won't put in an appearance at your local cinema palace, but we think you ought to make every effort to see a recently released movie, "The Captain's Idea." This wasn't made in Hollywood. It was made by Rust-Oleum Corp., Evanston, Ill. and features mainly rust control ideas, but the film has a few pointers Hollywood could use. As the company's news release says, for example, " . . . *this 30-minute film includes a lighthearted, fast moving plot and scenario with a complete cast of talent* . . . " Those fools on the coast are still using people.

Further reading of the release indicates that the fast moving scenario probably contains one of the greatest plot contortions of all times: "*Subtly weaved into a new version of boy gets girl, the film moves through interesting scenes showing new Rust-Oleum ways to stop rust and cut costs in the petroleum field, railroading, etc.*"

For complete information on the availability of the 16 mm., full color, sound movie, "The Captain's Idea," write on your letterhead to the Rust-Oleum Corp., 2425 Oakton St., Evanston, Ill.

Along with our copy of "Boys' Life" and an exorbitant bill for mandolin repairs, last month's mail brought word of what should be the Efficiency Expert's delight. It's a pair of scissors that can be used as 17 different tools plus—well, it's their pitch: we'll let them tell you just the way they told us.

"Here it is! Just what your readers have always wanted—a pair of scissors with a built-in stereoscope view of Grant's Tomb. Also built into the same pair of scissors such indispensable items as a nail file, a glass cutter and breaker, ruler, screw driver, pen knife, etc.,—18 items in all.

"Can you just see Dear Old Grandma cutting button holes with the 'Button Hole Cutter,' only pausing from time to time to snip off the end of a fresh cigar with the built-in 'Cigar Cutter?' Or Daddy tacking in a tack with the 'Tack Hammer' or mayhap turning a loose gas pipe with the 'Pipe Tongs?'

"Then when the day's work is done, everyone gathers around the Mazda Lamp and, ignoring the television, they gaze intently through what looks like a pinhead size piece of glass set in the shank. There they see five pictures, including such famous sights as Grant's Tomb, Rockefeller Center, The New York Skyline, Broadway at Night, Lower New York, all clearly labelled.

"Need we say more?"

Not for us, he needn't. If anyone wants to latch on to these miracle scissors, contact the Abbeon Supply Co., 179-15 Jamaica Ave., Jamaica, N. Y. From the motto on the company's letterhead, "Humidity is our business—and we know our business," these versatile shears can possibly also be used for cutting fog.

A colleague who makes a regular practice of beating us at chess, cribbage and other strenuous athletics, told us this story. To date it has not been authenticated.

It seems that the ministers of two small middle-eastern nations were lunching together and commiserating with each other on the terrible state of affairs in both countries. The situation was bleak and deteriorating rapidly. In the midst of the wailing and gnashing of teeth, one of the diplomats suddenly jumped up with a shout, "I've got it! I've got the answer to all our problems! We'll declare war on the United States!"

"Declare war on the United States? Are you crazy?," demanded the other giving his colleague a look usually reserved for those who have obviously lost their minds.

"I tell you this is the answer to our problems. We declare war. We mass our forces and launch one glorious, all-out assault. Naturally we lose. In a week we surrender. The Americans will occupy our countries. They'll send experts to rehabilitate our industry, find us markets, feed our people, suppress Communism, and re-equip our armies. We'll be back in business, bigger and better than ever!"

The other diplomat's eyes gleamed as the possibilities of this inspirational idea dawned upon him. "Why that's marvelous! That's the most —." He stopped, a look of doubt crossing his visage. "Wait a minute," he said, "Suppose we win?"

ENGINEERING AND MINING JOURNAL
JANUARY, 1953

A New Way to Drill a Hole

EVERY SO OFTEN at a meeting of mining men, someone makes the suggestion that several mining companies get together to finance a research project on some technical problem that no one of them could afford to tackle alone.

Everyone agrees that it would be a good idea, but no one does anything about it. Here is a brief account of a group of men who had that same idea and managed to carry it out. Because their ideas are directly related to mining, we think you'll find them interesting.

Drilling Research, Inc. is a non-profit research organization set up by 40 oil producing or exploration companies. Its sole objective is to discover a new way to drill a hole in rock, not just an improved way, but a new and better way. The new method, when found, will be available to the 40 stockholders and their licensees.

The idea for Drilling Research, Inc., was generated in a group of oil men who got together at a meeting of the American Petroleum Institute in 1948. Discussing the high cost of present methods of drilling oil wells, the group came up with the thought that if all their companies pooled their efforts, they could afford to do research on a scale no one of them could reach alone.

From this discussion, the idea grew swiftly, and on Jan. 1, 1949, Drilling Research, Inc. was formed. To finance its research for a new drilling method, the 40 stockholding petroleum companies, and four licensees who have since joined, have pledged a combined total of $1,178,976.06. By the end of 1951, a total of $543,609.14 had been spent, and the stockholders voted to extend the life of the experiment another two years to Dec. 31, 1953.

Drilling Research, Inc. has officers, an executive committee, a technical staff, a technical advisory committee, and a legal committee. In 1952, C. P. Dimit, vice president of Philips Petroleum Co., was president. The group does research on its own and also has contracts for research at Battelle Institute and at Columbia.

To begin with, the group made an exhaustive canvass of all possible ways of drilling holes. There are over 800, and if you're interested, DRI can count them off for you.

Only about 15 of these ways, however, have possibilities of developing into a new way of drilling a hole in rock. Of these 15, three show real promise, and of these three, DRI is currently most interested in vibration drilling.

For a while, DRI tested the possibilities of electric arc drilling, but dropped that method in Feb., 1951. Since then, the entire emphasis has been on vibration drilling, on means for getting electric power to the bottom of the hole, and on studies of how rock breaks up under drilling pressures.

It is impossible to give details of how this vibration is applied in the hole, or of how electric power is to be carried down to the bit, but DRI does believe that it can be done. It is difficult in talking to Mr. Dimit, for example, not to be tremendously impressed by what he refers to as "an experiment in industry-wide cooperative research on a project of such nature that it could not be accomplished by other than a cooperative effort."

It is possible that Drilling Research, Inc. may never find a new drilling method that will also be economically feasible, but the chances are that it will, and the oil industry is willing to bet over a million dollars on it.

The oil industry, remember, was using tungsten carbide for hard-facing bits over 15 years before metal mining began using carbide. Will it take that long to catch up with whatever DRI develops? Perhaps, but we hope not.

It is entirely possible for any mining company to join Drilling Research, Inc., as a licensee, even at this late date. Write to C. P. Dimit, vice president, Philips Petroleum Co., Bartlesville, Okla.

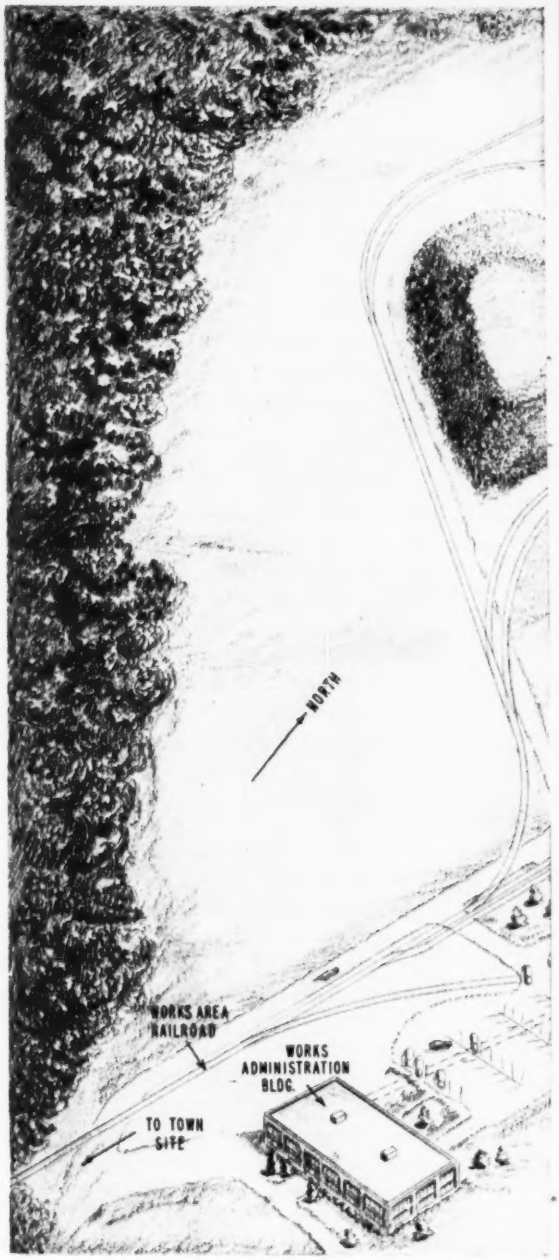
It is also possible for a group of mining companies to band together, as DRI was formed, and do research on their own. Rock drilling in metal mines, ore loading and transport, hoisting, the design of flotation machines, grinding of ore, all these topics fairly cry for large-scale research. If the industry isn't afraid to face the fact that many of its present methods are overly cumbersome and expensive, research on the oil industry model could pay off handsomely.

Mining companies right now are investing in the future through heavy expenses for exploration. What better guarantee of future profits could there be than an investment now in cooperative research to find the new methods that alone can meet the challenge of the future's higher costs? No one company can do it alone, and if no group of companies does it, the government eventually will.

WHITE PINE COPPER

Mine, Mill, and Smelter Construction Stepped Up As New Michigan Project Nears Production Stage

R. H. RAMSEY, Editor



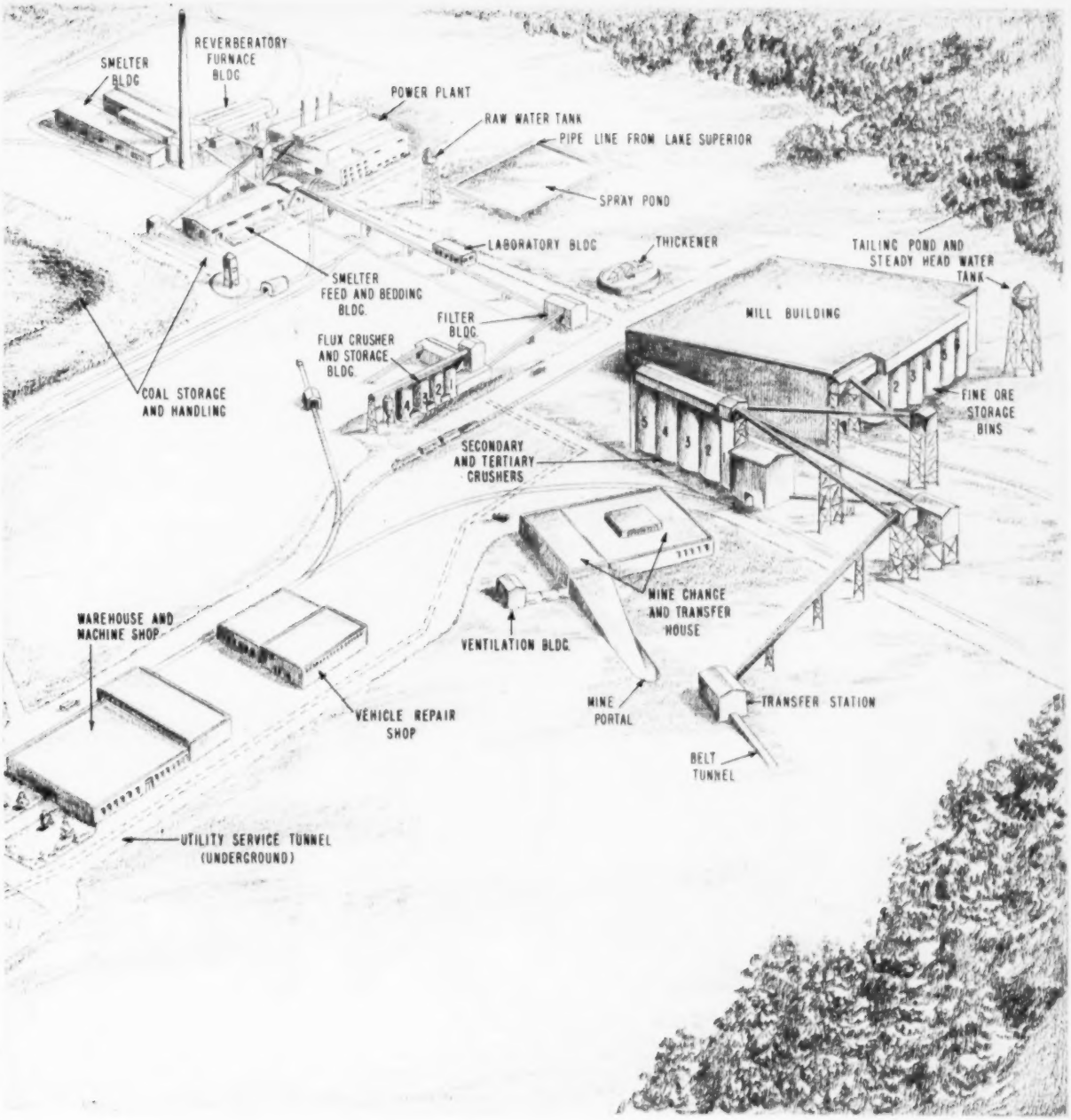
WHITE PINE'S PLANT will include buildings shown at right, many of them now under construction. Designed to produce 75-million lb. yearly, full output should be reached by Dec., 1954.

TECHNOLOGICALLY, economically, historically, the White Pine copper project catches your interest, however you look at it.

On the technical side, the mine will use Joy loaders and 18-ton shuttle-cars to produce 12,500 tons of ore daily on a six-day schedule. The mill, grinding 10,500 tons daily on a seven-day schedule, will use what must be the biggest ball mills and classifiers in the world, and will use cyclones at two very important points in its flowsheet. The smelter, using suspended-arch construction in the reverb., has a well-planned layout that combines present efficiency with provision for future expansion.

Economically, the White Pine project will not only add 75-million lb. of copper to U. S. annual production, it will provide an enterprise for Michigan's copper country, that will support a new town of 400 homes and about 2,000 people. Total investment will be about $70-million, of which $57-million will be loaned by the RFC and the remainder supplied by Copper Range Co., White Pine's parent company. Through it, there will be mined and processed something over 309-million tons of ore running about 1.10% Cu. Total reserves of ore will certainly run well beyond this figure, which is for ore developed by the drilling program thus far. First unit of the mill will start in Sept., 1954; full production should be reached by Dec., 1954.

Historically, White Pine stands



out as the first major peace-time copper project to come into production largely through government help under the Defense Production Act with a loan administered by the RFC. The project has assurance of a market for its metal through a contract with DMPA. This calls for purchase by DMPA of 243,750 tons of copper over a seven-year period, dating from first production. The base price will be 25½¢ per lb., subject to adjustment in line with movements of the Bureau of Labor Statistics' cost of living index.

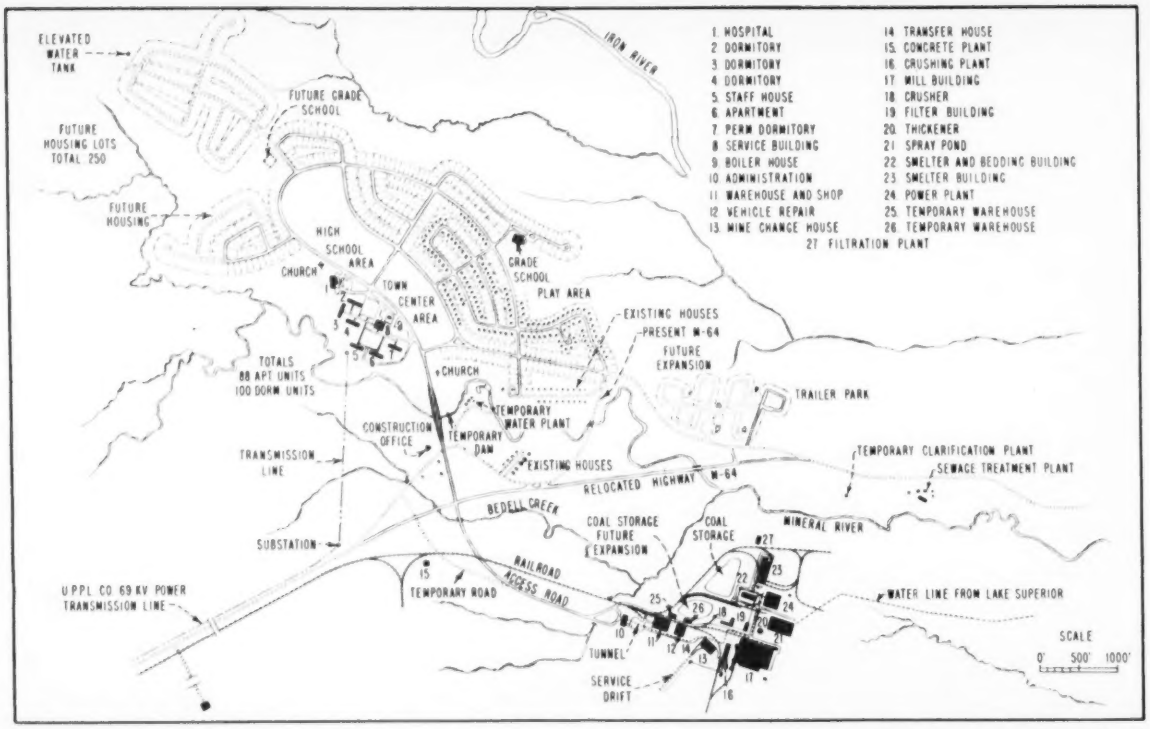
At the moment, final plans for White Pine's mine, mill, and smelter, and for its townsite, have taken shape, and construction is under way. A spur track about 14 mi. long is being built between White Pine and Bergland, a station on the main line of the D. S. S. & A.

White Pine's Beginning

The original White Pine Copper Co., (not connected with the present company), was organized in 1909 to mine a copper orebody about 20 mi. southwest of Ontonagon near the base of Michigan's Upper Peninsula. Ontonagon, itself, is the terminus of the Milwaukee Road's line into Upper Michigan and is a port on Lake Superior.

The old White Pine mine, as is the new one, is the most southwesterly of all the copper mines in Michigan's copper country. In contrast to the property now being developed, which contains chalcocite and native copper as the chief copper minerals, the old White Pine mine's value lay in native copper.

White Pine Copper Project (*Continued*)



WHITE PINE'S TOWNSITE is laid out as shown above. Now almost completely overgrown with brush, this area will become modern comfortable living center for at least 2,500 people. Note shopping center, schools, churches.

Harold B. Ewoldt, vice president of White Pine, now directs $70-million project in final stages.

G. M. Reaves, resident project manager, Turner Construction Co., the prime contractor to White Pine.

M. J. Hinckley, Turner's project engineer, keeps watchful eye on all engineering details and plans.

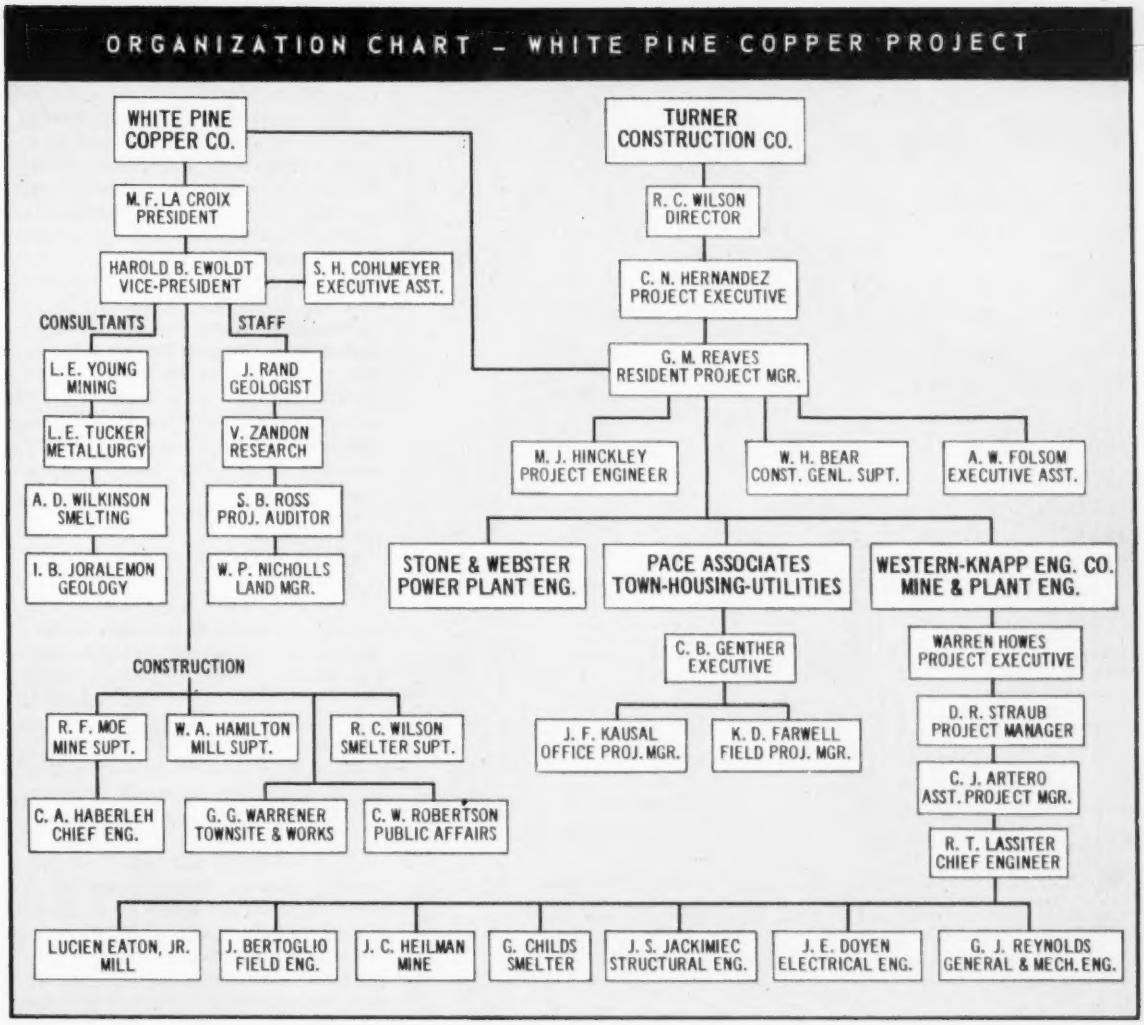
Warren Howes, project executive, Western - Knapp, directs design of plant processes and structures.

D. R. Straub, project manager, Western-Knapp, supervises mine, mill, smelter planning and design.

R. F. Moe, to be mine superintendent, comes from Missouri lead-zinc mining area near Fredericktown.

W. A. Hamilton, to be mill superintendent, has fluorspar, lead-zinc, and gold experience back of him.

R. C. Wilson, to be smelter superintendent, comes by way of Tacoma, Garfield, and El Paso smelters.


ORGANIZATION CHART – WHITE PINE COPPER PROJECT
WHITE PINE COPPER CO.
M. F. LA CROIX PRESIDENT
HAROLD B. EWOLDT VICE-PRESIDENT
S. H. COHLMEYER EXECUTIVE ASST.
CONSULTANTS
L. E. YOUNG MINING
L. E. TUCKER METALLURGY
A. D. WILKINSON SMELTING
I. B. JORALEMON GEOLOGY
STAFF
J. RAND GEOLOGIST
V. ZANDON RESEARCH
S. B. ROSS PROJ. AUDITOR
W. P. NICHOLLS LAND MGR.
CONSTRUCTION
R. F. MOE MINE SUPT.
W. A. HAMILTON MILL SUPT.
R. C. WILSON SMELTER SUPT.
C. A. HABERLEH CHIEF ENG.
G. G. WARRENER TOWNSITE & WORKS
C. W. ROBERTSON PUBLIC AFFAIRS
TURNER CONSTRUCTION CO.
R. C. WILSON DIRECTOR
C. N. HERNANDEZ PROJECT EXECUTIVE
G. M. REAVES RESIDENT PROJECT MGR.
M. J. HINCKLEY PROJECT ENGINEER
W. H. BEAR CONST. GENL. SUPT.
A. W. FOLSOM EXECUTIVE ASST.
STONE & WEBSTER POWER PLANT ENG.
PACE ASSOCIATES TOWN-HOUSING-UTILITIES
C. B. GENTHER EXECUTIVE
J. F. KAUSAL OFFICE PROJ. MGR.
K. D. FARWELL FIELD PROJ. MGR.
WESTERN-KNAPP ENG. CO. MINE & PLANT ENG.
WARREN HOWES PROJECT EXECUTIVE
D. R. STRAUB PROJECT MANAGER
C. J. ARTERO ASST. PROJECT MGR.
R. T. LASSITER CHIEF ENGINEER
LUCIEN EATON, JR. MILL
J. BERTOGLIO FIELD ENG.
J. C. HEILMAN MINE
G. CHILDS SMELTER
J. S. JACKIMIEC STRUCTURAL ENG.
J. E. DOYEN ELECTRICAL ENG.
G. J. REYNOLDS GENERAL & MECH. ENG.

The mine was worked from 1915 to Nov., 1920, when the falling copper price shut it down. Later the property was sold to Copper Range Co. In its producing period the old mine yielded 887,654 tons of ore supplying 18,233,000 lb. of copper and 260,681 oz. of silver.

The new mine will produce from the extension of the orebody worked in the old mine

A Second Chance

During World War II, Copper Range Co. decided to open up the large low-grade orebody known to exist near the old White Pine mine. This was in response to a request from the WPB for the mining industry to develop all possible sources of copper.

From the beginning, the present White Pine project has been under the general direction of Morris F. LaCroix, president of White Pine and of Copper Range Co., assisted by P. F. Beaudin, who is vice president of both companies.

Diamond drilling, mill tests, and studies of the White Pine deposit were under the direct supervision of W. H. Schacht, then president of Copper Range Co., from 1937 until his death in Sept, 1944.

Frank A. Ayer, vice president of Copper Range Co., managed the exploration of the White Pine orebody from 1945 until his retirement in early 1952. Mr. Ayer was assisted by W. E. Romig, then general manager of the mining division of Copper Range Co. Dr. L. E. Young for several years has rendered assistance in formulating plans for mining and mechanization.

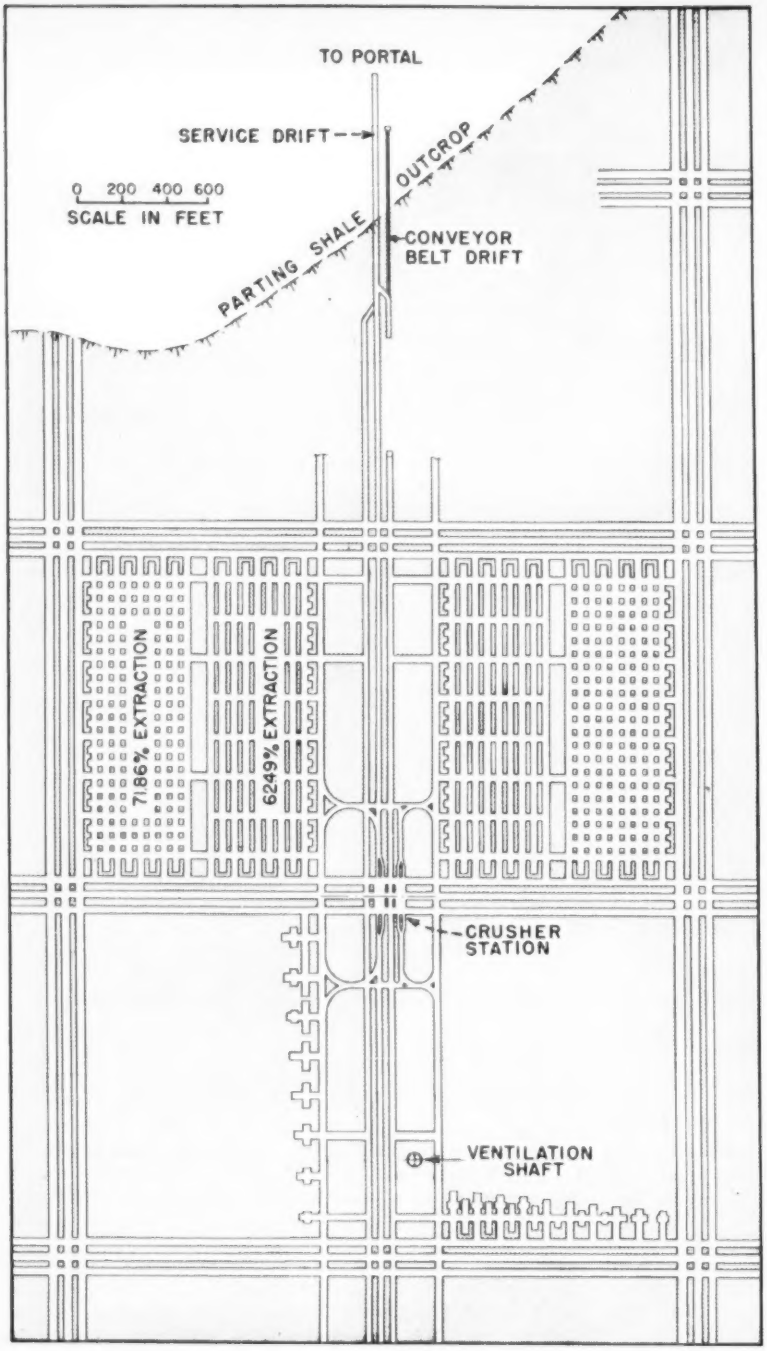
In describing the progress of the development,* Mr. Ayer mentions the help given by B. S. Butler's USGS Professional Paper No. 144. In formulating the geological picture of the White Pine orebody, most of the work was done by W. H. Schacht, Paul Billingsley, Ira Joralemon, Morris J. Elsing, Lloyd Scofield, the late Lucien Eaton, and others.

White Pine has certainly had the help of some of the most capable men in mining, as a glance at the accompanying organization chart will tell you. Not only that, the men now actively planning the White Pine project in offices scattered through a couple of buildings in Chicago's southern loop district are among the most enthusiastic men in mining.

Organization

The accompanying organization chart outlines the structure of the White Pine project. In brief, White Pine Copper Co. gave Turner Con-

* Frank A. Ayer, "White Pine Mine," *Mining Congress Journal*, Dec., 1950, p. 26



MINE DEVELOPMENT will be based on modified room-and-pillar method. Note how pillar area decreases away from central entry and crusher stations

struction Co. a management contract covering design, construction, and initial development of all phases of the development. As each one is completed, it will be turned over to White Pine, and by the end of 1954, the entire project should be in White Pine's hands as a going concern.

Turner Construction Co., 50 years old in May, 1952, has an international reputation for capable handling of big construction jobs; for example, the Chrysler building in New York. In the mining field they have done work for National Lead at Tahawus, N.Y. and for the Calco Chemical Division of American Cyanimid. They have erected over 2,500 large buildings covered by over 2,000 contracts in the U.S., Canada and Cuba.

Turner then sublet the design work on a fee basis to those companies shown in the chart. Stone & Webster, power plant specialists, took care of the power plant design. Pace Associates, architectural engineers, handled the design of all the non-plant buildings for the project and the townsite.

Pace Associates is the Chicago firm that did a similar job for the new town at Babbitt, Minn., where Reserve Mining Co.'s taconite project is getting under way.* The procedure at White Pine is that Pace does the design and takes bids for construction of houses and other buildings, but Turner actually lets the contracts.

A listing of contractors for the various phases of the actual construction job will be found at the end of this article. At last report, the project was on schedule and was likely to be finished on time.

Mill Design

Western Knapp Engineering Co., a division of Western Machinery Co., San Francisco, has a staff of over 100 in Chicago doing the design of the mine, mill, smelter, and water supply facilities. By arrangement with White Pine, R. F. Moe, mine superintendent, W. A. Hamilton, mill superintendent, and R. C. Wilson, smelter superintendent were on the WKE payroll during most of the design period. On Nov. 15 they were transferred to White Pine, and Messrs. Heilmann, Eaton, and Childs carried on as indicated in the chart.

WKE has had the benefit of the services not only of men like Mr. Childs on the smelter but of men like E. H. Crabtree, of Eagle-Picher, and Floyd Jardine on the mill. Mr. Jardine joined the WKE staff, in fact, as this article was being written.

Heading the White Pine organization under Morris F. LaCroix, president, is Harold B. Ewoldt, vice-president. Mr. Ewoldt, a South Dakota School of Mines man, had an unusually successful career in the Bureau of Mines, served in the Navy during the war, and later became manager of Calumet & Hecla's lead-zinc property at Shullsberg, Wis. He left that post in 1950 to become assistant to Mr. LaCroix of Copper Range Co.

* See "Reserve Mining Co. Starts Taconite Plant at Babbitt," *Eng. & Min. Jrl.* Nov., 1952, P. 72

Geological Structure

White Pine's orebody lies in the relatively flat-lying shales and sandstones at the base of the Upper Keweenawan Series, which is of Algonkian age. These beds have been folded, dragged, and faulted, the principal movement having thrust the ore beds upward about 1,500 ft. vertically and two miles horizontally to the southeast along the White Pine fault.

The sequence of ore-bearing beds, from upper to lower, is as follows:

Bed	Thickness, ft.	Copper Content, lb./ton
Upper Shale	3-5	25-30
Upper Sandstone .	3-5	4-5
Parting Shale ...	7-8	25-26
Lower Sandstone.	1	24-26

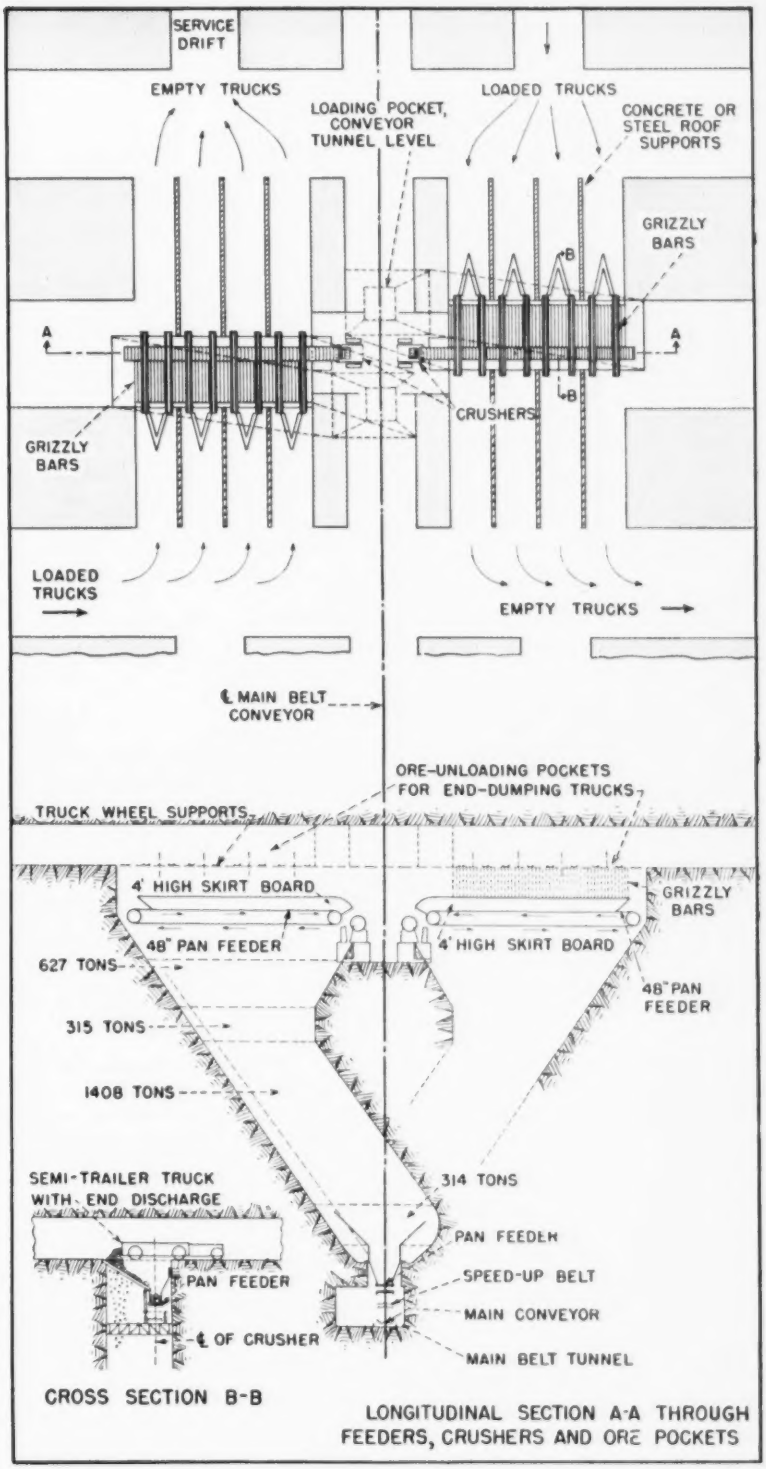
The lower sandstone, several hundred feet thick, contains several ore beds in the upper 50 ft. near the White Pine fault. At first, only the parting shale and the top layer of the lower sandstone will be mined. Later, tests will be run to see if the whole column can be mined, including the relatively barren upper sandstone, without undue dilution of the ore.

The chief copper mineral is chalcocite, with minor amounts present of covellite, bornite, and flaky native copper. These minerals are nearly all very finely disseminated through the sandstone or shale matrix, requiring fine grinding to release them.

The limits of the orebody have not been determined. It has been outlined by drilling over an area roughly 3x5 mi. In general, the ore beds lie in a gentle fold, the axis of which dips about 6%. The main entryway into the mine will be along this axis, with the mine workings extending out to either side down along the flanks of the fold.

There are numerous small faults in the area, which it was thought at one time might complicate the mining problem. However, these now appear to be adjustment fractures rather than true faults, and the displacement along them is minor. It will be possible to mine around any major displacement that may be encountered.

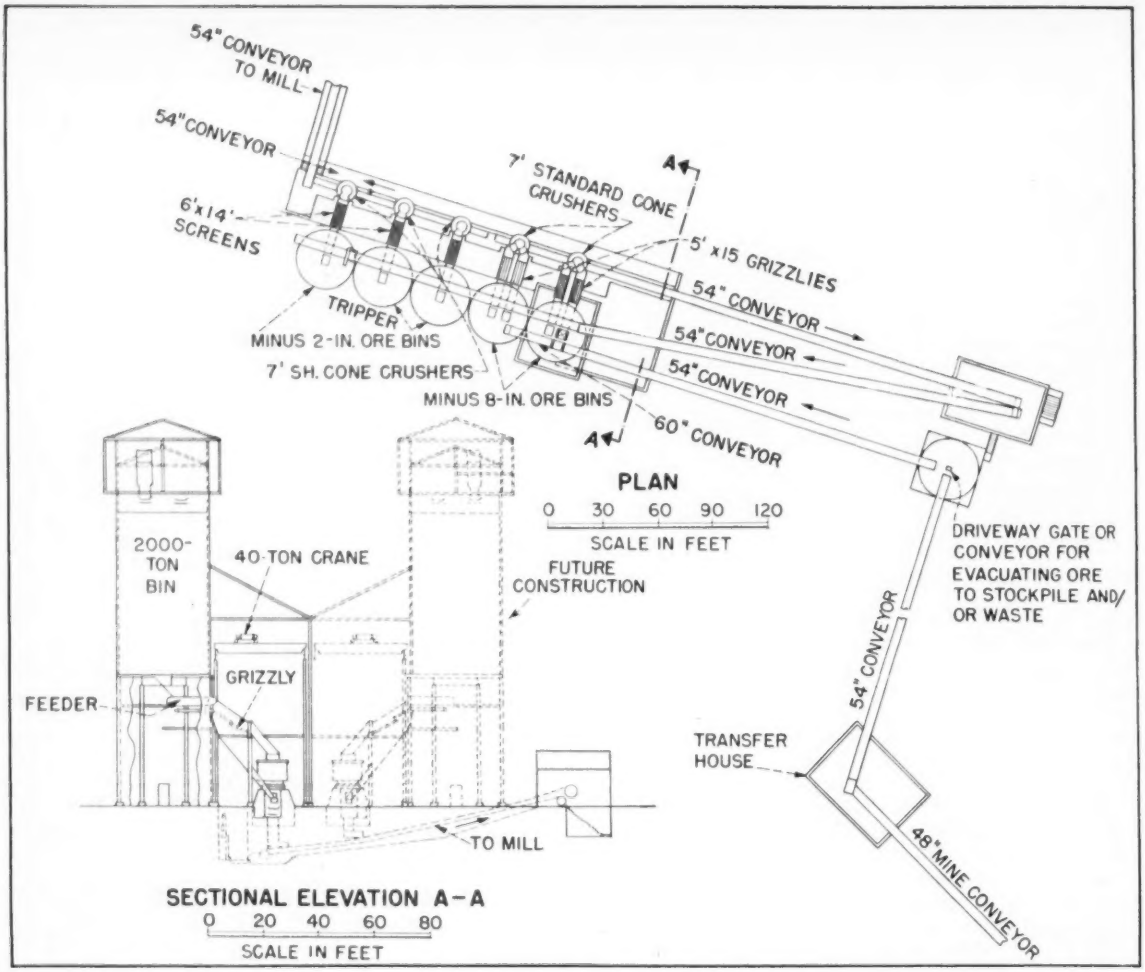
Total ore reserves at present amount to 309 million tons, averaging 21.3 lb. of copper per ton. In the parting shale alone are 154 million tons of higher grade ore averaging 24.3 lb. per ton.



CRUSHER STATION underground, showing how shuttle cars dump 18-ton loads into pockets feeding two jaw crushers. Conveyor hauls ore up incline.

Plan for Mining

The mining method, as is true of milling and smelting as well, has been planned to make use of modern, proven techniques. As the accompanying mine plan indicates, the method will be a modified room-



SECONDARY CRUSHING PLANT on surface uses 7-ft. Symons standard, and 7-ft. short-head Symons to reduce 8-in. ore to minus ⅛-in. Note scissors-belt arrangement to provide in-line layout, allow for later expansion.

and-pillar or open stope, operation using somewhat the same techniques developed at Carlsbad for potash and at Birmingham for iron.

Access to the mine will be through a concrete-lined tunnel extending from the surface to bedrock. This tunnel, connecting with the change house, provided two 12-ft. roadways and a 3-ft. manway, so that men and materials may be carried to and from the mine in trucks. Slope of the tunnel is 10%.

Ore will be transported from the mine on a 54-in. belt conveyor running in a separate drift inclined at 16% down to bedrock, and at 11 % on down to the ore-grass chutes that will feed the main belt.

As the mine plan indicates, barrier pillars will be left on either side of the main entries. About 65% extraction of the ore will be obtained in the first blocks beyond these pillars, then a beam pillar will be left, and about 71% extraction obtained in the next blocks. Thereafter up to 90% should be obtained in the outer blocks, where ground movement will not be a cause for concern.

Drilling at the working faces will be by "blueprint rounds" put in by Joy rubber-tired, or Rogers crawler-mounted, jumbos carrying two 3-in. drifters each. Working faces will be about 9 ft. high at first, but will go up to about 16 ft. if the entire ore-bearing column is eventually mined.

Air will be supplied by portable, or semi-portable, compressors, electric-powered, of about 720 cfm capacity. Each of these will operate two jumbos. Power will be brought into the mine at 13,800 v. ac to a substation, stepped down there to 4,160 v., and other transformers will provide 440 v. for the operating units. Small portable compressors of 360 cfm capacity will supply air for smaller jumbos or airleg drills on development work.

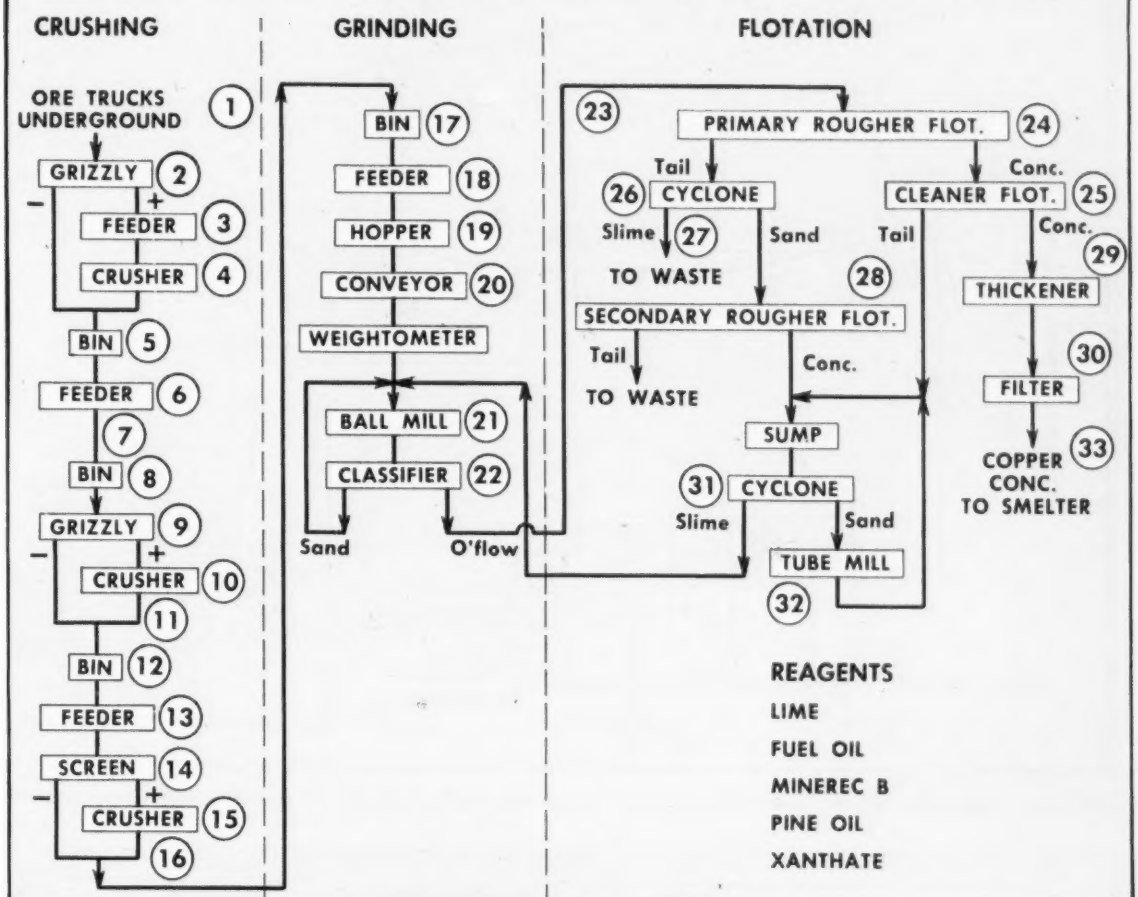
The company is exploring the possibilities of electric rotary drilling for small holes.

At the start of operations, Joy loaders will be used. These will be of the heavy-duty type used in loading iron ore in Birmingham. Other types will be tested as more experience is gained with the ore and the method.

Ore will be hauled to the crusher station in shuttle-car trucks with about 18-ton capacity, traveling at a top speed of 17 mph. At present, three types are scheduled for use. These are:

1. Darts, 18-ton load, 275 hp. Cummins diesel engine, two wheel steering, and apron-feed ejection for dumping its load.
2. LeTourneau, 18-ton, 315-hp. GM diesel-electric power, 4-wheel steering, flight-conveyor ejecting.
3. Joy, 18-ton, 240-hp. Hercules

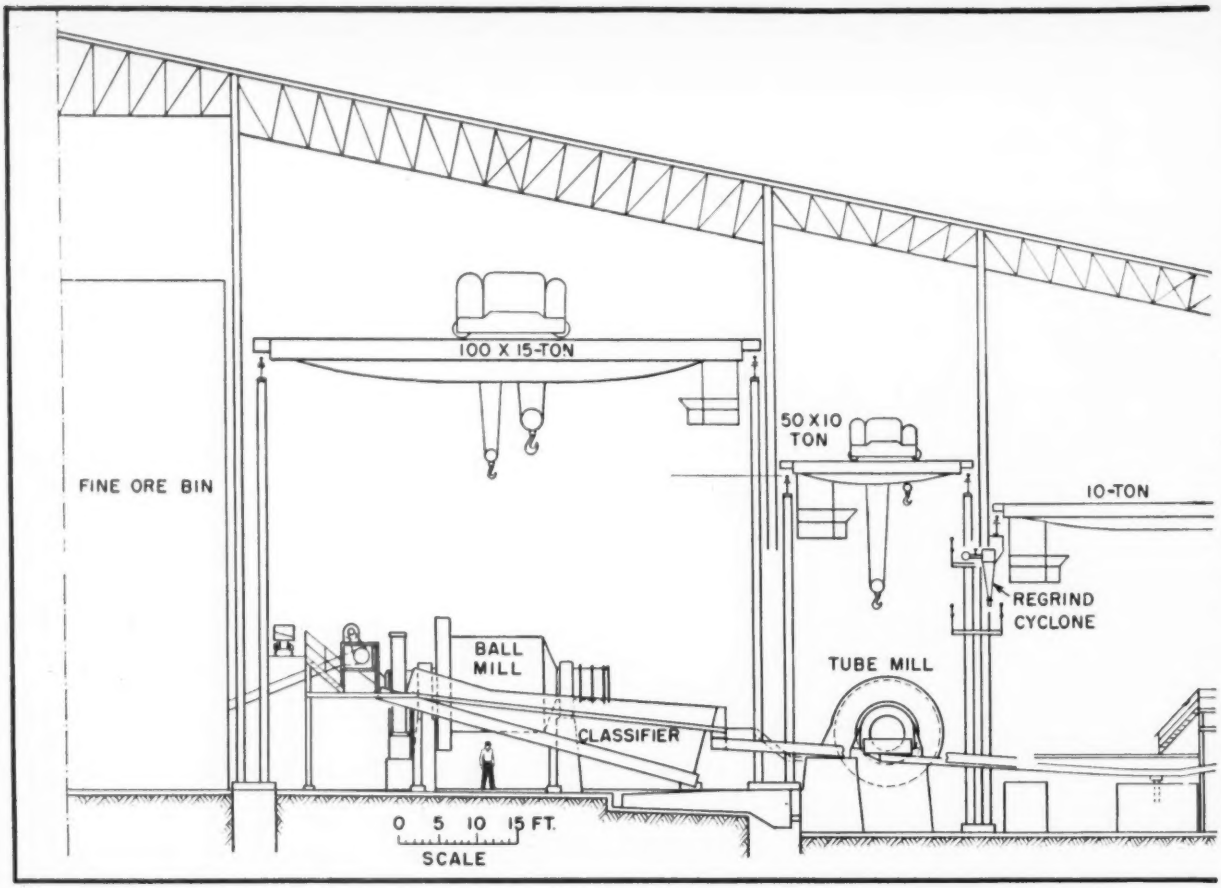
CONCENTRATION FLOWSHEET — WHITE PINE COPPER PROJECT



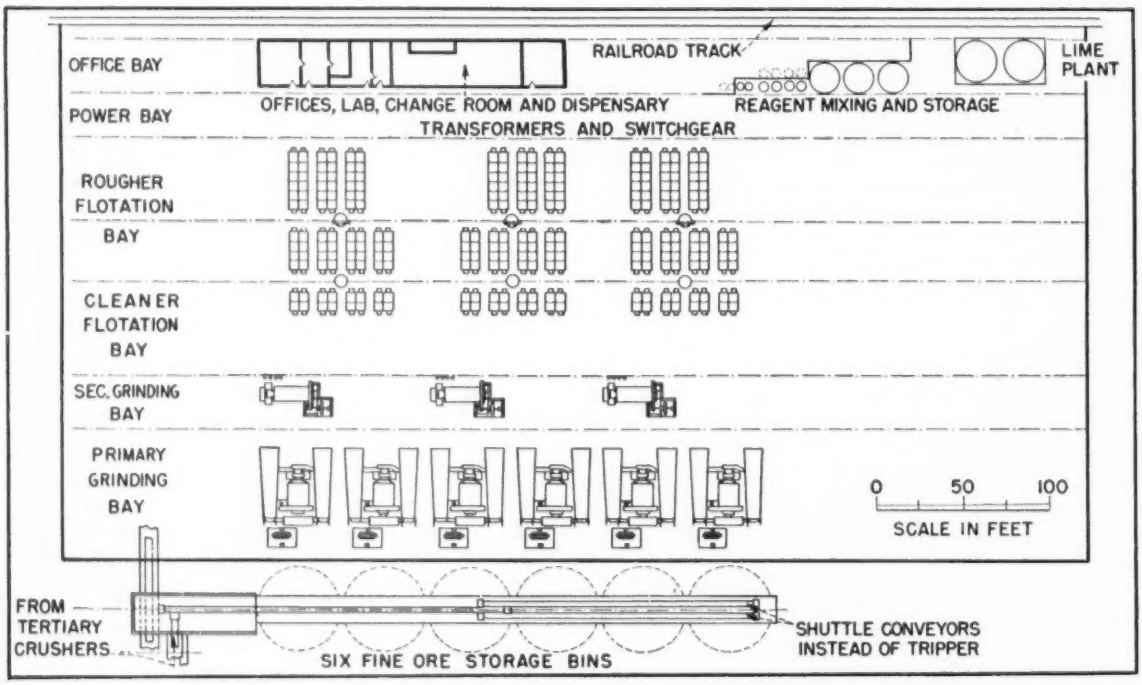
LEGEND

1. Shuttle-cars, 18-ton capacity, diesel or diesel-electric.
2. Grizzlies over two underground ore pockets, spacing 8 in.
3. Two pan feeders, 48-in.
4. Two Rodgers Blake-type crushers, 32x40-in.
5. Two ore pockets, capacity 2,000 tons.
6. Special belt-type feeder.
7. Conveyors out of mine. One 54-in. belt 1,800 ft. long, one 54-in. belt 1,600 ft. long, each driven by three 250-hp. motors. Following 54-in. belt system, carries ore to stockpile or to coarse ore bins.
8. Two coarse ore bins, 2,000 tons each.
9. Two 2-in. grizzlies fed by pan feeders.
10. Two Symons 7-ft. standard cone crushers.
11. Scissors belt system to top of medium ore bins.
12. Three medium ore bins, 2,000 tons each.
13. Three vibrating feeders, 4x14-ft.
14. Three vibrating screens, ⅜-in. openings, 6x14-ft.
15. Three Symons 7-ft. short-head cone crushers.
16. Collecting conveyor, 60-in.; then 54-in. belt system to top of fine ore bins, where ore is distributed by two 54-in. shuttle conveyors running in opposite directions.
17. Six fine ore bins, 3,200 tons each.
18. Four Jeffrey vibrating feeders under each bin (See drawing.)
19. Vibrators feed into cone-shaped hopper under each bin.
20. Hoppers discharge onto inclined 24-in. belt conveyors leading to ball mills.
21. Six 12x13-ft. Marcy grate mills; Lorain liners; 90 to 100 tons of balls 2-in. and finer; speed, 16 rpm., 72.6% of critical; two mills to a section, three sections in concentrator; total weight of mill, balls, & liners, about 300 tons each; driven by 1,500-hp. G.E. motors.
22. Twelve Wemco screw-type classifiers, 84-in., two per mill, 60-hp. motors.
23. Classifier overflow pumped to distributors, at 18% solids
24. Twenty-four rows, 4 cells each, 66-in. Wemco Fagergren machines.
25. Twenty-four rows, 2 cells each, 66-in. Wemco Fagergren machines.
26. Cyclone, size and type to be determined.
27. About 37% of weight of feed discarded here as barren slime.
28. Eighteen rows of 6 cells each, 66-in. Wemco Fagergren machines.
29. Thickener, 100-ft., Dorrco.
30. Filter, two 10x18 ft., Filtration Engineers, Inc., string discharge.
31. Cyclone, size and type to be determined.
32. Three tube mills, 7½x22 ft., Traylor Mfg. Co., 500-hp. motors.
33. Concentrate, mostly chalcocite, will run to 30 to 35% Cu.

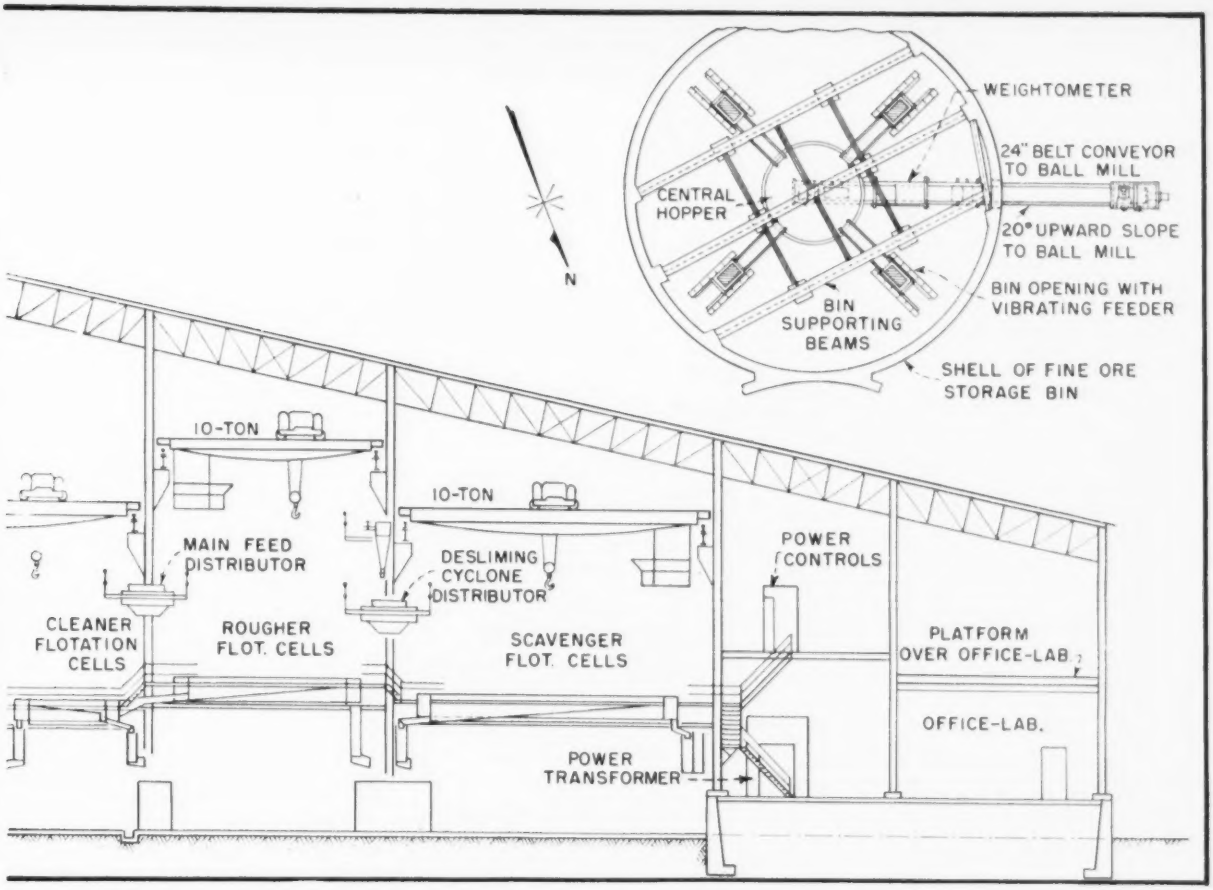
White Pine Copper Project (*Continued*)



SECTION THROUGH MILL shows relative size of huge ball mills, position of cyclones, and electrical control



MILL LAYOUT shows position of presently-planned units. First roughers are in center, scavengers are to the rear.

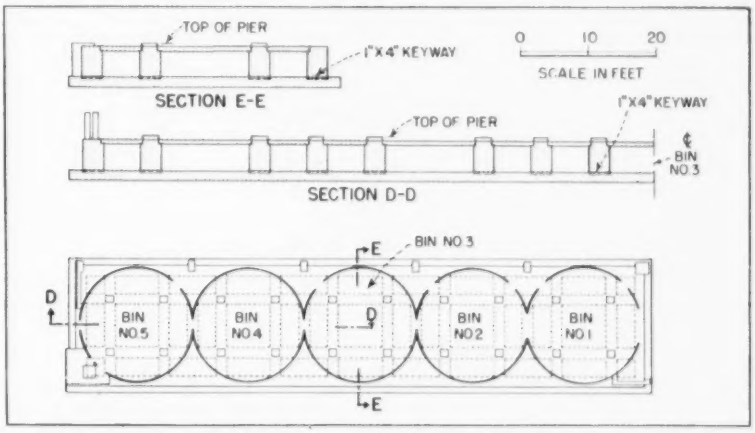


equipment. Building at far left is equivalent of 10 stories high. Note fine ore feeding arrangement shown above.

diesel-electric power, 2-wheel steering, flight-conveyor ejecting.

These units will haul ore into the central crushing station (see drawing) until a 2,000 to 2,500-ft. operating radius is reached. At that time, feeder conveyor belts may be installed. The question will then be considered, too, of whether or not to move the crusher station on down the slope to take care of the advancing mining operation.

If present plans mature properly, production from the mine will be at a rate of about 12 tons per manshift, including everyone on the job. If only underground personnel are included, the figure becomes about 25 tons per manshift. This is closely comparable to the productivity of a certain large underground copper mine where block caving is used.



SOLUTION TO PROBLEM of foundation for mill bins is this cellular construction. Slabs are pre-cast. Piling was out because of boulders.

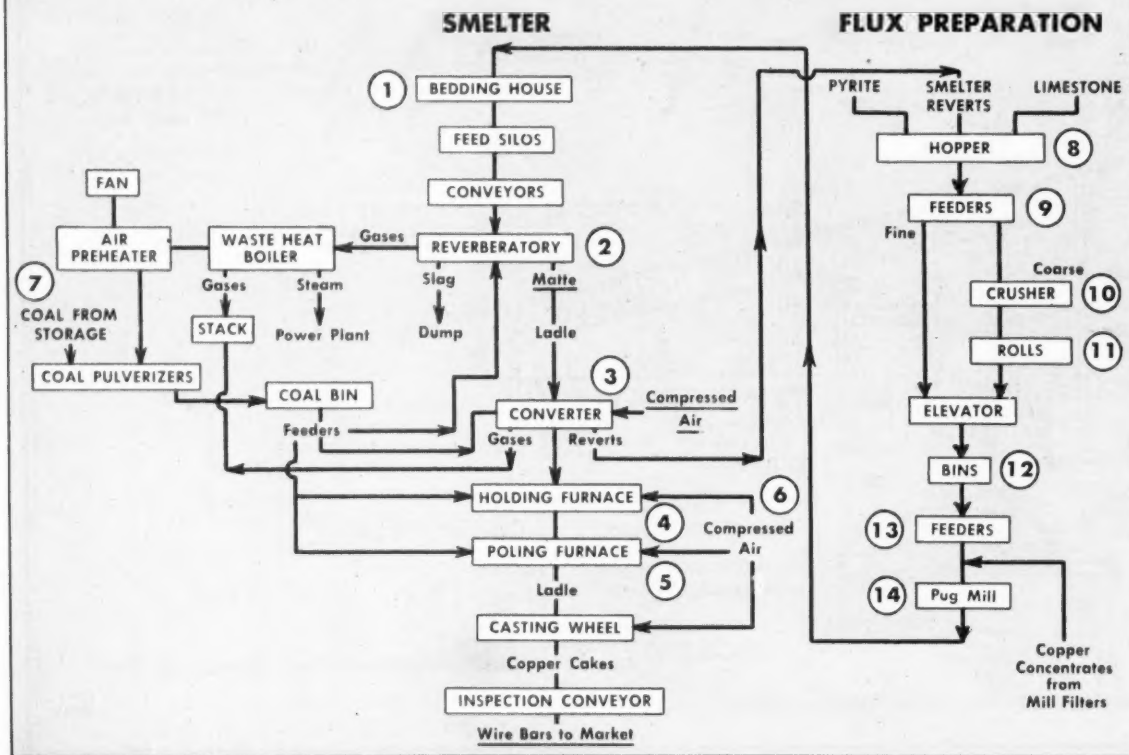
Crushing Made Easy

The course of the ore after it is dumped from the shuttle cars at the crushing station is indicated in the accompanying flowsheet. To summarize briefly, the crushing flowsheet includes jaw crushers underground to crush to minus 8-in., followed by standard and shorthead Symons cones to break the ore to minus 2-in. and minus $\frac{3}{8}$-in., respectively.

The White Pine ore is brittle and crushes easily. The staff estimates that less than one-third of the rock will be retained on the 8-in. grizzlies in the crushing pockets and thus go through the primary crushers.

Note in the drawings the attention given to free flow of traffic across the dumping points and to fast handling of rock below the

SMELTER FLOWSHEET—WHITE PINE COPPER CO.



LEGEND

1. Smelter feed consists of: Concentrates (25% Cu), pyrite (FeS_2), and limestone (in the proportion 19 tons of concentrates to 1.9 tons of pyrite to 6.65 tons of limestone) plus smelter reverts. Pyrite may be bought as mine run lump not over 8 in., in which case it must be crushed, or as mill tailing. Limestone may be bought as quarry run, up to 8 in., or as chats. Reverts must be crushed.
2. Reverberatory furnace, 28 ft. 8 in. by 110 ft. Slag to dump will be 504 tons per day.
3. Converter, 13 by 30 ft., Converter air, 25,000 cfm at 14 psi.
4. Holding furnace, 13 by 20 ft.
5. Poling furnace, 15 by 20 ft., with 3 spoon ladles.
6. Compressed air at 100 psi from 500-cfm compressor.
7. Two air preheaters, 2 centrifugal fans, 3 coal pulverizers, and 3 pulverized coal feeders.
8. Receiving hopper, 2100 cu. ft. effective capacity.
9. Reciprocating feeders, two. Each feeds 20 tph limestone or 37 tph pyrite.
10. No. 3 Standard Symons cone crusher, set to ¾ in.; 40 tph limestone or 74 tph pyrite.
11. Crushing rolls, 42 by 16-in., set to 3/16 in.
12. Bins, 4, including one 1000-ton pyrite bin and three 550-ton limestone bins. Storage capacity adequate for 21-day supply of pyrite and 10-day supply of limestone at estimated rate of use for initial operation of 10,500 tons per day.
13. Four weigh feeders, one for each bin.
14. Pug mill delivers 80 tph, plus or minus, of smelter feed to 24-in. conveyor to bedding house.

crushers to avoid delays by hang-ups.

The two 54-in. belts running in series that move the ore out of the mine travel at 400 fpm and are driven by three 250-hp. motors each. The conveyor drift is, of course, well below the stoping level.

All the secondary and tertiary crushing units are arranged so that capacity can be increased easily at any time simply by adding more units in the areas provided.

Note in the crushing plant layout drawings how a convenient in-line arrangement of secondary and tertiary crushers has been made possible by use of scissors-conveyors.

Provision has been made for diverting ore to a stockpile, and for reclaiming it, if for any reason mine production should run ahead of mill storage capacity.

In the belt carrying the fine ore to the mill bins tension proved to be so high as to preclude use of a tripper to distribute ore among the six bins. Instead, ore will be fed to one of two shuttle conveyors, running in opposite directions, which can be shifted to fill any of the bins.

An interesting point in regard to these bins is the way in which foundations have been provided to support the terrific weight which they impose. These six concrete bins are nearly 10 stories high; they are 50 ft. in diameter; they hold 3,000 tons each. Soil pressure under them comes to 4,500 lb. per sq. ft.

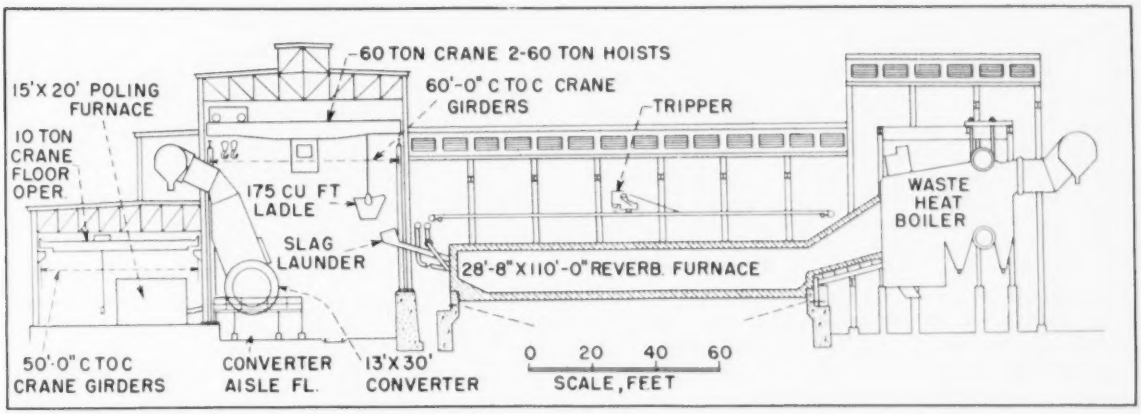
The problem here is that for 40 ft. under the mill site there is nothing but glacial till and clay, scattered through which are many boulders. These latter prevent use

of piling to support the bin's weight.

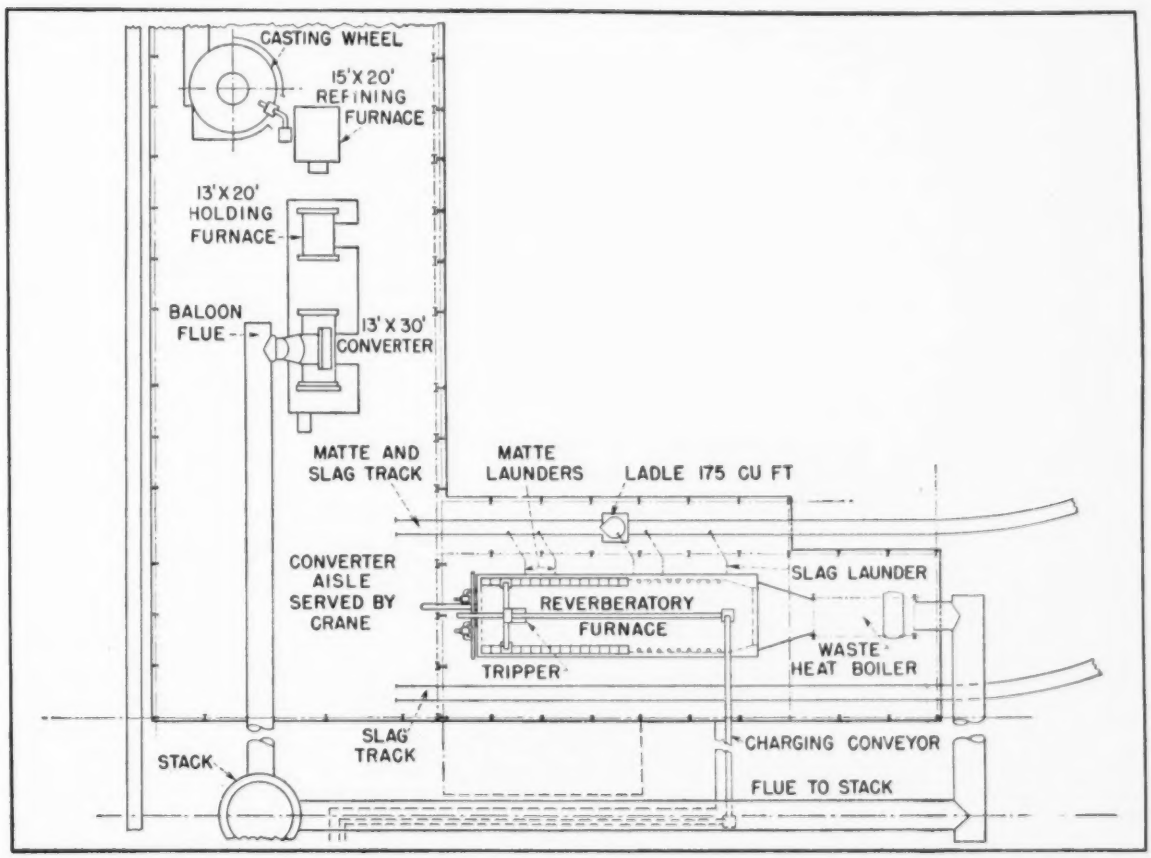
The problem was solved by using the cellular concrete foundation mats shown in an accompanying drawing. These spread the weight sufficiently but use much less concrete than would a solid mat 6 ft. thick. Also, the designers had to assume that this area would freeze during a winter mill shut-down, and solid concrete, therefore, wouldn't do. The structure, shown on p. 81, is believed to be one that will handle all of these problems.

Note also the arrangement for feeding ore out of these bins to the ball mills. There are four square openings in the bin bottoms from which vibrating feeders pull ore into a central hopper. This, in turn, feeds a belt which leads through a conveyor scale to the ball mill. Use of these four openings should largely avoid arching in the bin or segregation in the discharge.

Ever since work began on White Pine 16 years ago, it has been

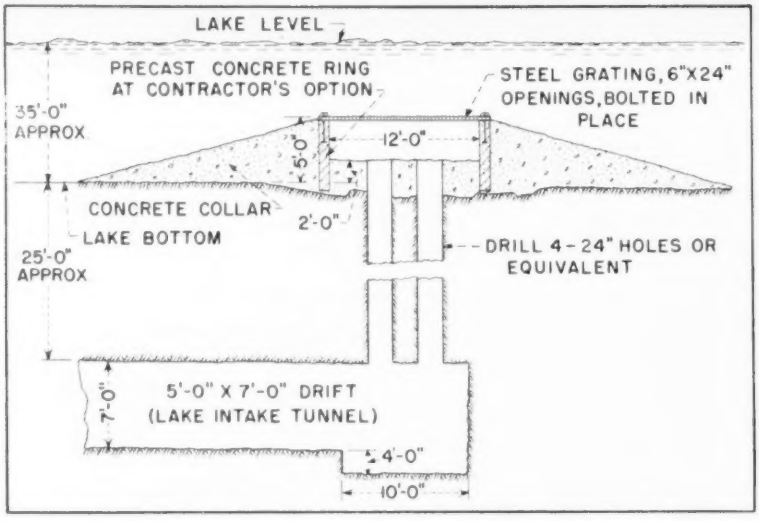


SMELTER SECTION shows sloping uptake from reverb. to waste heat boiler. Reverb. will use suspended-arch, basic refractory construction owing to need for continuous operation of single furnace on which whole project depends.



SMELTER PLAN shows row of square hoppers over reverb. through which feed enters from tripper in belt from flux mixing plant. Note space left for additional furnaces and converters if more capacity is wanted.

How Would You Do This?



Shown above is the water intake that must be built on the bottom of Lake Superior, under 35 ft. of water, 1,500 ft. from shore. Send your plan for driving this drift, building the intake, and connecting it with the drift, as shown, to The Editors, Engineering & Mining Journal, 330 West 42nd St., New York, 36, N.Y. For the first five letters that come nearest to what the contractor actually does, we'll pay $20 apiece. All letters become our property.

---

recognized that the grinding was a major problem. For a long time, it was believed that it was necessary to grind all the ore to minus 325 mesh to get a 35% concentrate with an 85% recovery.

Grinding Is Key

It was discovered within the last year or two, however, that the chalcocite was indeed finely disseminated through the ore, but that it tended to be concentrated in the cementing material in the sandstones and shales.

Testwork then indicated that at a 65 mesh grind, about half the copper in the ore could be recovered at once in a cleanable concentrate. The other half was contained in a floatable middling.

It was apparent then that the flowsheet ought to provide for rougher flotation at a coarse grind and for regrinding at least a part of this rougher concentrate to 325 mesh. If that were done, it ought to be possible to recover most of the remaining copper in a satisfactory concentrate.

Huge Ball Mills

As a result, the White Pine flowsheet was designed as it is shown herewith. The mill will probably handle a higher percentage of mids than most such mills. For that reason, the ratio of primary grinding to regrind capacity is about 3 to 1.

The Mine & Smelter Supply Co. ball mills, probably the world's biggest, are quite a study in themselves. They are 13x13-ft. in size and are powered by 1,500 hp. G. E. motors. There will be 90 to 100 tons of balls (probably 2-in. and finer); one mill, with Lorain liners, and ball charge will weigh about 300 tons. It will not, therefore, be possible for a traveling crane to pick up a mill and charge for relining when necessary.

They will run at 16 rpm, which is 72.6% of the critical speed for such mills. The grate type of discharge will be used. Feed to the mills is all minus $\frac{3}{8}$ in. Each mill will be operated in closed circuit with two 84-in. Wemco classifiers. Each mill is expected to grind about 1,750 tons per day to minus 65 mesh.

Bushings are of lead bronze, and a flood oiling system is provided for each mill. There are heaters for cold weather, and a high pressure hydraulic jack for taking the weight of the mill while starting, so that oil can flow into the bearings at once.

The objective in getting these mills as large as was feasible at present was to cut down the installed cost per hp. of grinding power expended. The larger the mill, the lower this figure. To use mills small enough to use 800 hp. motors would be to run capital costs up about $500,000 beyond the cost of the large mills.

Actually, the limiting factor on the size of the mills was the capacity of the railroads to handle them. The ring gear around the shells is a split gear made by Falk Corporation and machined to fit.

Flotation Simplified

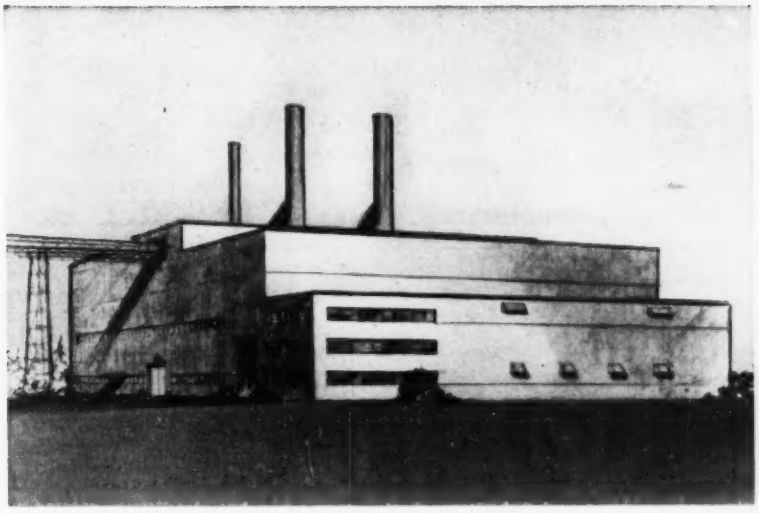
At one time it was believed that a satisfactory recovery of White Pine's copper could be made only by a flotation time of about 43 min., which would have been prohibitive. In the hundreds of tests that were made over the last few years, this time has been steadily reduced until the flotation time required at present is not excessive.

Note that following the rougher flotation step, the tailing goes through a cyclone. The sand goes to a second rougher float and eventually to regrind. The slime is discarded. This step is highly important in that it gets rid of about 37% of the material in the feed as a barren tail, and by removing the slime it speeds up subsequent flotation and permits use of smaller amounts of a strong collector that would otherwise be rapidly absorbed by the slime.

Reagents

Reagents used are: lime, fuel oil to cut the action of some bitumen found in the ore; Minerec B and Xanthates for collectors, and pine oil and an alcohol for frothers.

The only remaining problem ap-



POWER HOUSE includes three Westinghouse 15,000 kw. turbines, two with their own boilers, one supplied from the waste heat boiler in the smelter.

pears to be the determination of the proper size for the cyclones. This will be done by rigging up a pump and a similar feed in closed circuit, with various sizes of cyclone.

An outstanding feature of the While Pine mill will be the unusual dependence on pumps. At any one time, there will be pumped about 100,000 gpm in the mill, which is no small feat in itself.

For Efficient Smelting

The flotation concentrate follows the flowsheet shown for the smelter. Because the concentrate is largely copper sulphide and silicates of various kinds, it is necessary to add pyrite and lime rock to make the charge produce a more satisfactory slag.

As sent to the reverb., the concentrate will assay about:

Moisture	20%
Copper	35
Al_2O_3	8
Sulphur	7
Iron	5
CaO	2
MgO	3
SiO_2	28

Total — 88% dry

From the filter building, the flotation concentrate travels to the smelter on a belt over a Weightometer. The registered weight automatically controls feeders that drop lime and pyrite onto the concentrate belt in exactly the right amounts. This concentrate-flux mix is mixed thoroughly in pug mills and the resulting charge is conveyed to two storage silos, each one of which has the capacity to supply a single charging cycle for the reverb.

In addition, there will be a bedding building where mixed charge and flux can be piled as they come from the mill. With a capacity of 9,000 tons of charge, this bedding yard will be built up by discharge to it of mixed charge from the mill through a tripper. The material will be reclaimed by a bulldozer running along the side of the pile and scraping charge onto a belt that passes along one side of the pile.

The reverberatory furnace, which is 110 ft. long and 28 ft. wide, will have a flat suspended arch throughout. Basic-type refractories will be used. Chief reason for this construction is that with only one furnace in the smelter, it must be kept going practically indefinitely. This is possible only with the suspended arch of magnesite brick.

From the feed silos, the reverb. charge is carried on a conveyor down the length of the furnace and is fed out through a reversing tripper to any of several hoppers along the sides of the furnace. Through these hoppers, and an 8-in. pipe, the charge will drop onto the pile of material already in the furnace.

White Pine will use the wet side-charge smelting method. The aim will be to keep the sides covered with a pile of unsmelted charge that will slough slowly into the bath in the center of the furnace. It is hoped thereby to cut dust losses in charging the extremely fine concentrate and to avoid explosions.

Fuel for the reverb., as well as for the other furnace units is powdered coal. A complete coal pulverizing and distribution system has been worked out for White Pine by Babcock & Wilcox Co.

Heating the reverb. will take about 120 tons of coal per day. The secondary air to the coal burners will be preheated to about 420 deg. F. by means of steam from the waste heat boiler. This preheating radiator is placed near the boiler, resulting in a short steam line and a long hot air line. The air used in conveying the coal from the pulverizers constitutes the primary air to the burners. Rate of coal fed and the draft control are both automatic.

Charge Is Unique

It's worth noting that no other U. S. smelter treats a charge like White Pine's. The only ones close to it are the reverb. charges at Roan Antelope and Mufulira.

The point is that because there is almost no iron in the concentrate, it must be added along with lime to slag off the silica and alumina and to control the grade of matte.

Slag is tapped from the furnace through a trough leading to three 15-ton slag pots on cars spotted on a track at a lower level alongside the furnace. A 45-ton diesel-electric locomotive pulls this small train and does other plant switching.

Matte is tapped from the middle of the furnace and led out into a ladle carried by a self-driven electric car operated by push buttons. Grade of the matte is about 65% Cu owing to the lack of iron.

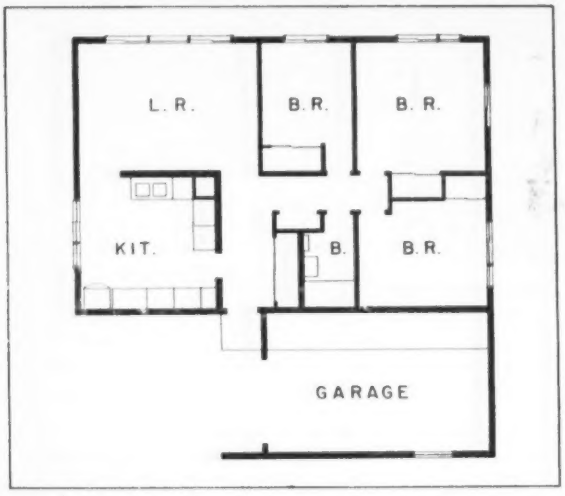
The matte is converted in one 13 x 30-ft. Peirce-Smith converter, to which 25,000 cfm of air at 14-lb. pressure is supplied by an IR three-stage centrifugal blower. Owing to the high grade of the matte, it is planned to convert an entire day's output of matte in one eight-hour shift. There will be produced about 180 tons of matte per day.

Because converting can be done in eight hours, there seems no need at present to try automatic tuyere punching to save time. Later, if output is expanded, the automatic punching may become necessary.

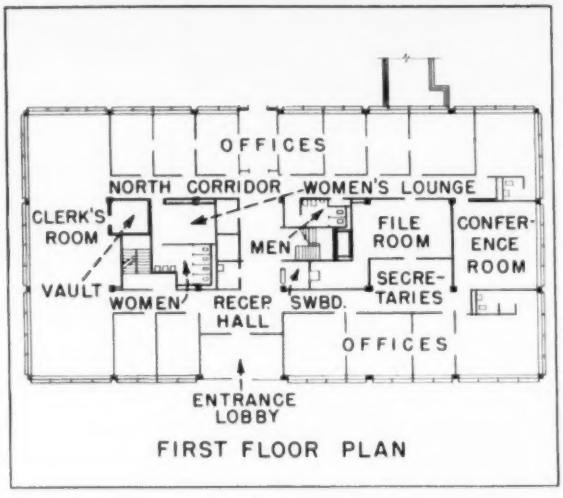
Converter copper goes to a 12 x 20-ft. holding furnace, where the final oxidizing blow is completed with air lances.

Because of the unusually high purity of the White Pine ore, it will be possible to make fire-refined copper of high quality without electrolytic refining. The final refining is done in a poling furnace to remove oxygen, producing copper of 99.9% purity.

Copper will be cast on a 32-ft. wheel of the universal type made by H. M. Treadwell Mfg. Co. It will be



HOUSING will be varied among six basic designs, one of which appears above. About 450 units are going up.



ADMINISTRATION BUILDING features modern appearance, heavy construction to match rigors of winter.

possible to cast various shapes including wirebars.

The converter, holding furnace, and the converter aisle crane are driven by dc from an m-g set. If the ac power fails, the flywheel on the m-g set will have enough inertia to turn the converter out of the stack. This feature cuts in automatically when the blast pressure drops to a predetermined point.

Because there is no valuable element in the ore other than copper and silver, there is no point in trying to recover dust other than in the balloon flues. The plant has a 500-ft. stack of reinforced concrete lined with acid-resistant brick.

The waste heat boiler is a two-drum Sterling type. It will supply steam at 900 lb. pressure and 900 deg. of superheat. The connection between the boiler and the reverb. will be by sloping uptake with a suspended arch over it of firebrick.

Power and Water

Power from the Upper Peninsula Power Co. is distributed in the townsite and for construction work by the primary system at 13,800 v. Secondary voltages are: 4,160 v. for 250 hp. motors and up; 440 v. for motors under 250 hp.; and 110 v. for fractional hp. motors. The company's studies indicate that the capital investment is lower for 4,160-v. equipment, and that there are other favorable factors.

Water for the plant and for the townsite's water purification plant will be pumped 5 mi. through a 36-in. pipe line from Lake Superior. Flow will amount to about 15,000 gpm. Note the type of underwater intake to be used, as shown in the accompanying drawing, and note also the invitation to work out your own idea as to how to build it.

The Town Grows

Icy weather and the completely overgrown terrain made it tough for Pace Associates to plan the townsite. For example, it can get down to 30 or 40 below at White Pine, and there is an annual snowfall of about 155 in., probably the heaviest in the U. S.

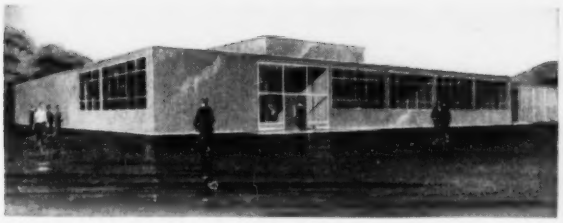
However, 465 lots, 70 x 125 ft. or larger, have been laid out and homes on them should be 80% completed by the end of next summer.

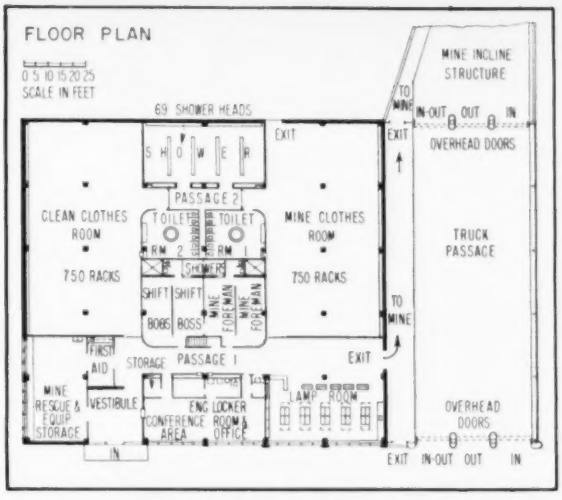
The houses Pace has designed for White Pine would be attractive anywhere, as the drawings indicate. They have redwood siding, are all on one floor, and are built in six basic designs to avoid monotony in appearance.

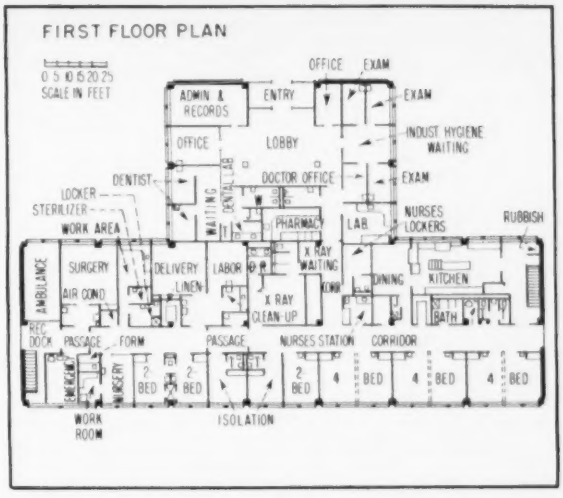
C. B. Genther, executive for Pace Associates, who did architectural engineering design.

The houses have electricty, sewers, water, no gas, radiant heating in the concrete floor slab, no basements, electric washers, driers, hot water heaters, graded and drained sites. All have garages and extra storage space. There are also 88 apartment units for childless couples, and 100-room dormitory for single men.

The new town will have an arcade-like shopping center with maximum protection from the cold for shoppers. There will be an elementary school and a high school with all necessary laboratories, auditorium,







CHANGE HOUSE is built connecting with tunnel into mine so men need not go outside until set for it.

HOSPITAL has every needed facility for taking care of White Pine community. Note well-planned layout.

J. F. Kausal, office project manager for Pace, supervised design of townsite, housing.

swimming pool, cafeteria, churches, and all facilities necessary to the needs and comfort of the community.

There will be a 20-bed fireproof hospital completely equipped for every eventuality. The town center also includes provision for a fire and police station, post office, and an auto service center.

Pace Associates also designed the non-process buildings for the company, some of which are shown. All these are of reinforced concrete with brick and glass exteriors. Insulation in all buildings and houses is of 3½-in. Fiberglas. The roofs of the houses are made of terne metal.

Estimates of the probable population of the new town of White Pine, Mich., vary, but there should be about 2,000 people making their homes there before long.

The Power Plant

Power for the works area only will come from a power plant housing three Westinghouse 15,000-kw. turbines, two of which run off their own boilers and one of which is tied to the smelter's waste-heat boiler. The plant has an interchange arrangement with the Upper Peninsula Power Co. whereby it buys power when needed, or sells it to the power company if White Pine has a surplus.

Nerve center of the whole plant area is the utilities tunnel, indicated in the plant perspective opening this article. This tunnel connects all buildings and carries 23 different products, wires, liquids, gases, or what have you. Everything from butane to telephone gossip goes through this tunnel, and it is one of the most ingenious and convenient ideas at White Pine.

That, in brief, is what is going on up at White Pine and in the planning offices in Chicago. I am tremendously grateful for the opportunity to see all this in action and to present it in *E&MJ*. Our special thanks to Mr. LaCroix and to Mr. Ewoldt for making it possible, and to all the other men in White Pine Copper Co., Turner Construction Co., Western-Knapp, and Pace Associates who so cheerfully answered the hundreds of questions on which this article is based.

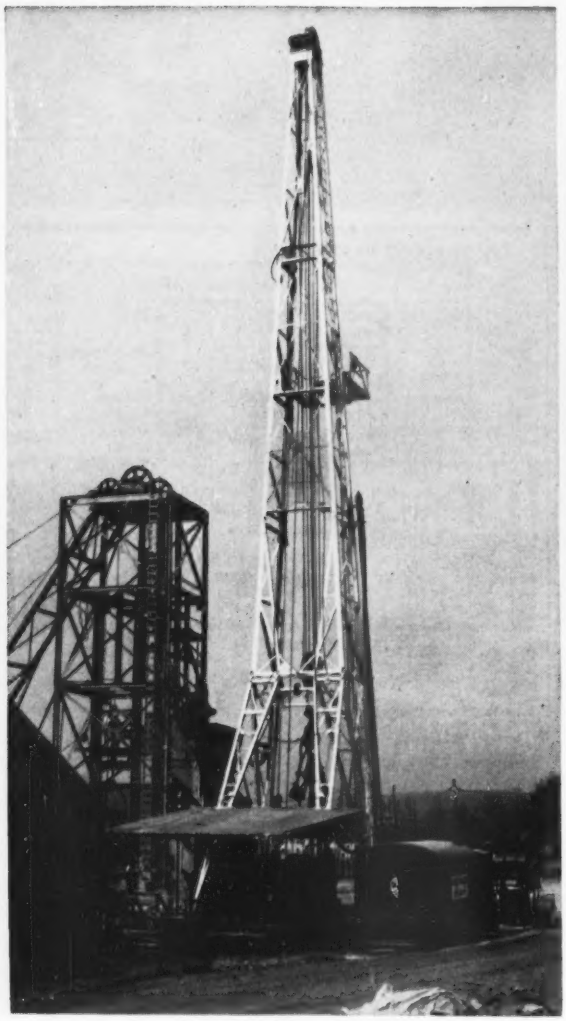
White Pine's Contractors

Engineering

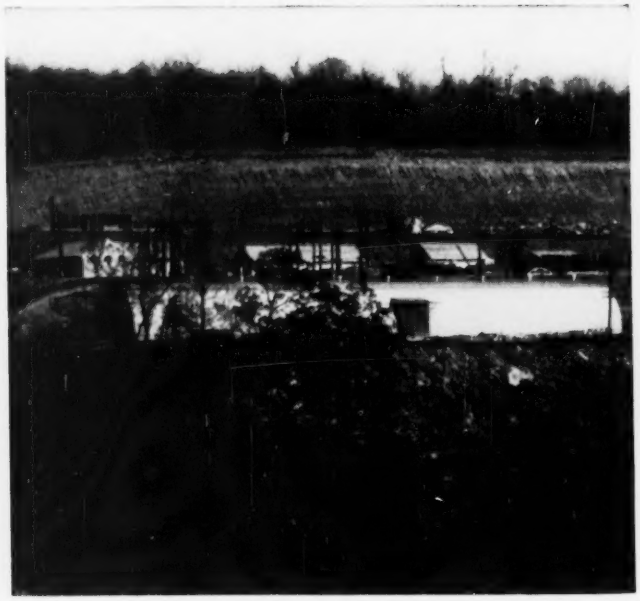
Stone & Webster Engineering Corp.—power plant
Pace Associates—townsite and non-process buildings
Western-Knapp Engineering Co.—mine, mill, and smelter
Duluth, South Shore & Atlantic Ry.

Construction

Turner Construction Co.—agent, management and construction contractor
Dingle Clark Co.—electrical
Anderson & Cherne—mechanical
Bates & Rogers Construction Co.—excavation
Herman Gundlach, Inc.—housing
La Breque Pearce Co.—sewers
Hoyle-Newberg Co.—concrete
Penegor & Runtilla Lumber Co.—clearing
Thornton Construction Co.—gravel



RIG USED to drill large holes for draining ground ahead of sinking at "A" shaft, towers above headframe.



GRACE MINE'S SURFACE PLANT will be adequate for

Bethlehem Steel's New Grace Mine

It is opened on first important blind ore-body found by airborne magnetometer.

A. W. KNOERR, Associate Editor

HOIST AND COMPRESSOR BUILDING will serve "A" shaft, right, and, from end nearest camera, the "B" shaft also. Latter was collared in September. Its site is 275 ft. this way from "A" shaft. Compressors will be in center.

handling 12,000 tons per day of ore and waste. "A" shaft's headframe, center, stands back of hoist building.

BETHLEHEM STEEL CO.'S new Grace mine near Morgantown, Pa., is now under development. Two shafts are being sunk, and construction of surface buildings is proceeding on schedule as shown in the accompanying photographs. The mine has been named in honor of Bethlehem's dynamic chairman, Eugene G. Grace.

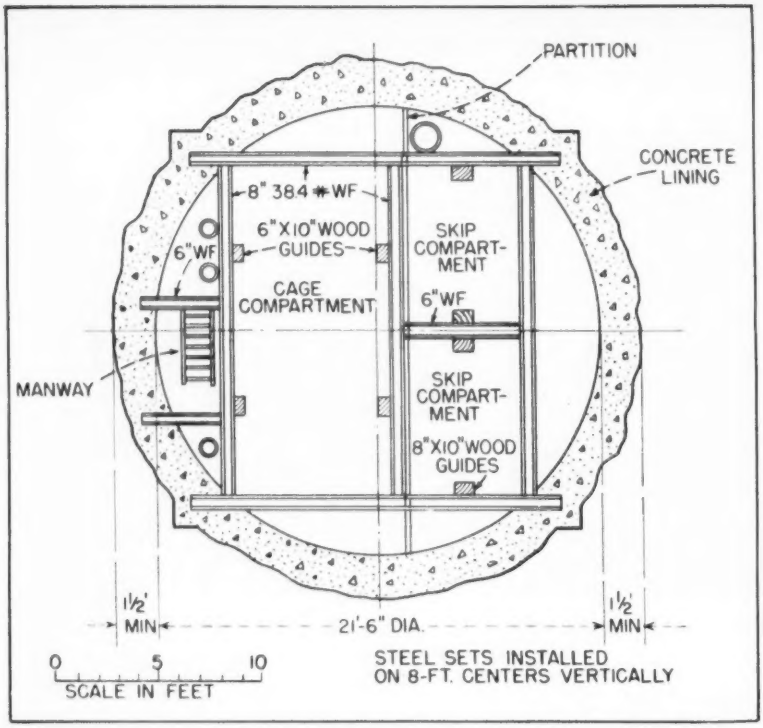
Discovery of the major orebody at this property is both fortunate and significant. Fortunate, because the orebody lies close to the company's blast furnaces and steel plants at Bethlehem; and significant, because it is the first important blind iron orebody to be discovered by the airborne magnetometer.[1] Importance of this discovery is further amplified by the fact that the orebody lies at depths ranging from 1,500 to 3,000 ft. in an area where surface expression would defy the best of geologists to deduce presence of iron ore at depth.

Thus Bethlehem's exploration staff is to be congratulated for its early acceptance of a new and modern geophysical technique to supplement the talent of its geologists. It was only in 1946 that the airborne magnetometer story was released from the wraps of government security for the mining industry,[2] and yet early in 1948 Bethlehem employed this technique to run a 900,000-acre survey which revealed a sharp magnetic anomaly over the site of the present Grace

[1] "Aeromagnetic Survey Helps Find New Pennsylvania Orebody." By Homer Jensen, chief, magnetometer section, Aero-Service Corp., *E&MJ*, August, 1951, Pp. 56-59.

[2] "The Airborne Magnetometer—A New Aid to Geophysics." *E&MJ*, June, 1946, Pp. 70-75.

SHOP AND WAREHOUSE for the Grace mine will be housed here, in near and far ends respectively of the structure. In picture shown at top, this building is behind hoist and compressor house and to the right.



CONCRETE-LINED "A" SHAFT will have two 20-ton skips in balance in the two compartments indicated in this section. It will be about 3,000 ft. deep.

mine. Diamond drilling at depth proved this to be a major orebody.

Acquisition of the property was in itself an accomplishment, because as every exploration engineer well knows, the moment a diamond drill or churn drill moves into an area, the purchase of land becomes difficult. Thus when a "mystery buyer" proceeded to acquire some 1500 acres in this thoroughly settled agricultural area, rumors soon spread that (1) the land was being purchased to fatten Texas cattle for eastern markets, and (2) that the area contained uranium. Of course the fact that a mysterious plane carrying a suspended bomb-like "bird" had flown back and forth over the area previously may have had a part in stimulating imaginations. In January of 1950 it was finally revealed that Bethlehem Steel Co. had acquired the site of a possible iron mine.

The Orebody

The orebody is kidney-shaped in plan and is a massive magnetite replacement of Paleozoic limestone which underlies the Triassic sediments of this area. Depth of the deposit varies from 1,500 to 3,000 ft. Average grade of ore is about 44% iron.

Two circular, concrete-lined mine shafts with steel sets are now being sunk approximately 2,500 ft. from the orebody. The larger, called the "A" shaft, is 21½ ft. in diameter, and will be sunk to a depth of about 3,000 ft. Two compartments of the "A" shaft (see drawing) will accommodate 20-ton capacity bottom dump skips to be hoisted in counterbalance; the third will accommodate a cage for handling materials and supplies. The "A" shaft was started in August 1951.

A second, or "B" shaft, is being sunk about 275 ft. from "A" shaft. Sinking started in September, 1952. Depth will be about 3,000 ft. Diameter is 17½ ft. This shaft will handle men and materials and will serve as the air intake for ventilating the mine.

Hoisting units for the two shafts will be installed in opposite ends of a long building. The intervening building space will be occupied by four air compressors and two motor-generator sets which will provide dc power for the "A"-shaft hoists.

Ore will be mined by a block-caving method similar to that used at Bethlehem's Cornwall[3] operations. Haulage levels will be driven at 100-ft. intervals, and ore will be loaded from slusher drifts at the bottoms of ore passes.

When the mine is in operation, up to 12,000 tons of ore and waste will be hoisted per day to provide mill feed and sustain development work.

[3]The Grace mine is operated by the Cornwall Division of the Bethlehem Cornwall Corp.

"A" Shaft Project Unique

Several aspects of the "A" shaft project are unique. For instance, in many shaft-sinking operations today, the crews are forced to battle water all the way down to the bottom. Not so at the Grace mine "A" shaft, because here the job planners reasoned that a lot of water would be encountered, and a logical solution to the problem would be to lower the water table with submersible-motor type, deep-well pumps placed in large-diameter drill holes located around the shaft. Accordingly a number of churn- and rotary-drill holes, 24 and 12 in. in diameter, are being put down 60 to 70 ft. from the shaft center to depths which may reach 1700 ft. Deep-well pumps operating in these holes have effectively drained the water away from the sinking area, and needless to say this advantage is most appreciated by the shaft-sinking crews.

Because of caving in the drill-holes, churn-drilling has been discontinued, and a conventional oil-well rotary drilling rig is being used to put down additional holes.

As illustrated in the accompanying shaft section, the shaft sets are made of steel and emplaced in concrete on 8-ft. vertical centers. Concrete forms are of steel consisting of four sections, each covering a 90-deg. sector of the circumference. Triangular hitch boxes are attached to the steel forms to provide cavities into which corner extensions of the steel shaft members may be positioned and later grouted into place. When stability of the rock permits, five sections of forms are set in place at one time, thus permitting the pouring of concrete in 40-ft. lifts. The concrete lining of the shaft is 18 in. minimum thick and is poured against the country rock. Because of the circular section, steel reinforcing is not required in the concrete, except at the collar of the shaft.

Approximately 56 cu. yd. of concrete is required per 8-ft. section of shaft. Concrete is mixed in a central batching plant and is lowered down the shaft in 1½-cu.-yd. concrete buckets which are filled

(Please turn to page 109)

What Too Much Safety Factor Can Do In Operating Centrifugal Pumps

F. R. FORREST
Centrifugal Pump Dept., Allis-Chalmers Mfg. Co

ACCUMULATION OF SAFETY FACTORS taken when purchasing a centrifugal pump can often result in overrating. This condition causes excessive power consumption and higher maintenance.

Three phases have to be considered usually to build a new pump and have it operate efficiently. They are: 1. Arriving at the proper pump values. 2. Manufacturing pump. 3. Checking installation.

1. Arriving at Proper Values. A pump user has a choice of three methods of determining his pump specification. He may do it by himself, he may call in the pump manufacturer to help him, or he may turn the entire problem over to the manufacturer. These values, when determined, consist of the actual required gallonage, plus a safety factor of 10 to 50% and the total dynamic head (which includes static elevation plus friction loss plus another safety factor). The safety factors are necessary for several reasons and cannot be omitted.

2. Manufacturing the Pump. To make sure that he will meet the guaranteed conditions requested, the manufacturer adds another safety factor, either by supplying a slightly larger impeller diameter than necessary or by increasing the speed if the pump is belt-driven. If the pump is driven by a squirrel-cage induction motor, the actual speed will be in excess of the guaranteed rated speed unless the motor is overloaded. This is another safety factor, introduced by the motor manufacturer.

After the pump is put in service, it is not unusual to find that sufficient gallonage is obtained by just cracking, or slightly opening the discharge valve. This is due to the summation of the safety factors. If the pump is allowed to operate in this manner, excessive horsepower and head will be consumed.

If a throttling valve cannot be used, as when solids in suspension are being pumped, the resulting operation would be at very high gallonage and low total dynamic head. This condition causes high horsepower consumption due to low operating efficiency and also causes very high abrasive action. The internal metal contours of a centrifugal pump are such that when the pump is operating in the highest efficiency range, the flow is approximately parallel to these contours. It can be seen that if the actual operation point is in a low efficiency range, the direction of flow will not be parallel to the contours but will tend to be at some angle to them. This condition causes abrasive action.

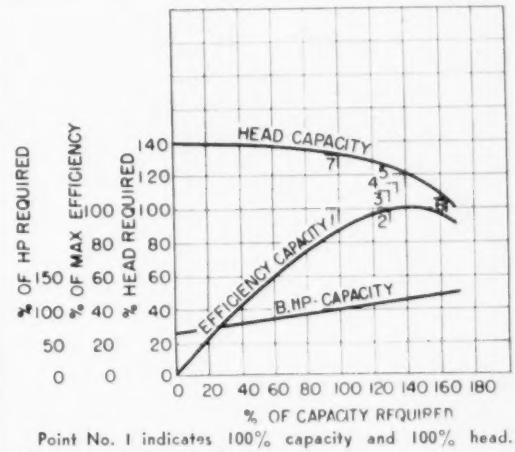
3. Checking the Installation. Because the safety factors cannot be eliminated from the original considerations, the answer to the problem of obtaining high operating efficiency lies in checking the installation. After the installation is completed, the manufacturer is usually eliminated from the picture unless trouble in operation occurs. Such trouble may result from the accumulation of safety factors.

It is therefore to the pump user's advantage to determine the actual operating point of the pump as soon as he can after installation. Data taken should be submitted to the manufacturer, either for approval of the operating range or for corrective recommendations. He will need to know the pressure at the pump suction, pressure at the pump discharge, and the pump operating speed in rpm.

The accompanying chart indicates seven points to show, step by step, the accumulation of safety factors and how they cause poor operating conditions and costly maintenance.

Whether operating at Point 6 or 7, it can readily be seen that both points are out of the best operating range, which is from 130 to 150% on the capacity ordinate. Operating at either Point 6 or 7 will increase abrasive action on all parts and cause a power loss due to lower efficiency.

As an example, if the pump was actually operating at Point 6 and was direct-connected to the motor, the impeller should be turned to a smaller outlet diameter so that the operating point will conform more closely to the requirement Point No. 1. This reduction in impeller diameter will reduce gallonage, decrease the power requirement and increase the service life of wearing parts. If the pump is belt-driven, the same results are obtained by decreasing the pump speed.



Point No. 1 indicates 100% capacity and 100% head. These are actual required values.

Point No. 2 indicates a 30% increase in capacity as a safety factor.

Point No. 3 indicates a 10% increase in head as a safety factor.

Point No. 4 indicates an over-capacity and head taken by the manufacturer in the way of larger impeller diameters.

Point No. 5 indicates an over-capacity and head due to increased motor speed above guaranteed full-load motor rpm.

Point No. 6 indicates actual operating point which can be determined by taking rpm of pump, and the discharge and suction pressure as referred to pump manufacturer's characteristic curve.

Point No. 7 indicates the operating point if a valve in the discharge line is throttled so as to deliver the 100% capacity. The difference in head and power is then being consumed through the valve as a complete loss.

IN EXPLORING AND DEVELOPING uranium deposits, the mining man becomes involved with geiger counters, radioactivity, gamma rays and other features of this atomic age. Until now, little

What the Uranium Prospector

SINCE THE DISCOVERY of radioactivity in 1896, physicists have attempted to determine the nature of the radiations emitted by radioactive materials. As a result of this study, numerous types of radiations have been identified, including alpha particles, beta particles, gamma rays, protons, positrons, neutrons, mesons, neutrinos and others. Fortunately, in most mining work only the first three, particularly gamma rays, are of importance. All radioactive elements emit either alpha or beta particles, and this reaction may be accompanied by gamma ray activity.

Types of Radiations

An alpha particle is identical with the nucleus of a helium atom. It has atomic weight of 4 and a double positive charge. Because of their comparatively large mass, alpha particles are readily stopped by collision with atoms, and hence the effect of alpha particles is limited to the area immediately surrounding their source. A few sheets of ordinary paper or a few inches of air stop alpha particles.

A beta particle has a single negative charge and a mass equal to that of an electron; essentially, a beta particle is a high-speed electron. Because of their very small mass, beta particles have greater penetration ability than alpha particles, but still they are absorbed by a few millimeters of lead.

Gamma rays possess neither mass nor charge and behave like low energy x-rays. They are less readily absorbed than alpha or beta particles and hence have somewhat greater penetration power. Radioactive materials produce gamma rays having a wide range of energies. The low-energy ("soft") rays can be absorbed by thin sheets of lead, but considerable thickness of lead is required to stop the high-energy ("hard") rays. The gamma rays from uranium are stopped by approximately:

3 in. of lead,
1 ft. of rock,
2½ ft. of water,
Several hundred feet of air.

Because of the penetrative power of gamma rays, most prospecting counters are designed to detect gamma rays, rather than alpha or beta particles. These counters vary widely in style, size, complexity, and price; however, all belong to only three fundamental types—geiger counters, scintillation counters, and ionization chambers.

Many kinds of geiger counters are manufactured and before purchasing one, the user should determine which type most nearly fits his needs. Most counters cost between $35 and $400. A list of counter manufacturers can be obtained by writing:

U. S. Atomic Energy Commission
Division of Raw Materials
Box 30, Ansonia Station
New York 23, N. Y.

Although the geiger counter is most popular for field use, a second type of instrument—the scintillation counter—has recently been placed on the market. Present models cost more than geiger counters, but they offer several advantages, especially higher sensitivity.

A third type of instrument, the ionization chamber, has been used but has not proved popular and hence is not discussed here.

Geiger counters are calibrated in terms of the roentgen (R), which is the standard unit for the measurement of X-radiation. The roentgen is defined as that quantity of X-radiation which will produce one electrostatic unit of ions in one cubic centimeter of air under standard conditions of temperature and pressure. Since the roentgen is a measure of the quantity or amount of radiation, the rate of production of radiation rays—in other words the intensity of a radioactive field—must be expressed in terms of reontgens per unit of time. Most field geiger counters are calibrated in terms of milliroetgens per hour. One milliroentgen is one-thouandth of a roentgen.

The Uranium Series

Any element can be made artifically radioactive by bombardment with suitable particles. A number of elements, however, are naturally unstable, and these undergo spontaneous radioactive decay. One such element is uranium. The uranium in rocks and minerals contains two types of atoms—one with atomic weight of 238 and the other having atomic weight of 235. Uranium-238 is much more abundant than uranium-235 by ratio of 142 to 1. Because of its greater abundance, the atoms of uranium-238 are large-

had been written on these subjects for the use of the prospector, geologist and engineer, but here, in a nutshell, are the facts that will make you and your geiger counter a more effective exploration team.

ROBERT J. WRIGHT
Assistant Chief Geologist
Grand Junction Operations Office
U. S. Atomic Energy Commission
Grand Junction, Colo.

Should Know About Radiation

ly responsible for the radioactivity of uranium ore.

When an atom of uranium-238 disintegrates, it forms an atom of the element thorium-234. This, too, is radioactive and decays to form protactinium-234, which is also a radioactive element that undergoes decay. This type of chain reaction continues with the formation of other radioactive elements, until finally an inactive element, lead, is formed. Thus, uranium-238 is the parent element of a long series of radioactive elements. Each is formed by radioactive decay and each decays in turn to yield another radioactive element. The series begins with uranium-238, includes 13 radioactive daughter elements (one of which—radon—is a gas), and finally ends with lead, which is inactive and undergoes no further decay.

The uranium-238 series is one of three naturally occurring radioactive series, which together include 38 elements. Each of these three series begins with an isotope of uranium or thorium, has a single gaseous member, and concludes with a stable isotope of lead. In most uranium ores uranium-235 and thorium-232 are present in such minute quantities that their effect is not significant and radioactivity stems almost entirely from the uranium-238 series. A fourth series with neptunium-237, an artificial element, as the parent has recently been identified.

The various members of the uranium-238 series are listed in Table II. The first column, "Element," lists the name of each element and its atomic weight. The second column, "Radiometric Designation," notes the term which is commonly used to identify each member of the series. These designations were applied by early researchers before it was recognized that the radioactive members of the series are identical with the various elements. The "Half Life," column 3, is the time required for each radioactive member to lose half of its radioactivity; hence, the half life figure is a measure of the relative speed of decay. This varies quite widely from UI, which has a half life of 4,550,000,000 years, to RaC', with a half life of 0.0002 seconds. In one half life, an element loses 50% of its original radioactivity (Fig. 1). In five half lives, it loses 96% of its original radioactivity, and hence is essentially exhausted. Column 4, "Radiations," notes the type of emissions given off by each element. The average strength of each type of emission is noted in a million electron volts (mev.).

What the Geiger Measures

Column 4, "Radiations," is of particular importance in understanding field counter readings. Each element emits either an alpha or a beta particle, and in addition, five of the elements are gamma emitters. *It is important to note that uranium itself does not give off gamma rays.* Therefore a geiger counter, which largely detects gamma rays, cannot detect uranium directly. Instead, the counter measures the radiations of the five gamma ray producers, particularly the strong emitters RcC and UX_2. When the five gamma ray emitters are present in amounts proportional to the amount of uranium, the counter can give an accurate measure of the uranium present, but only under this condition. This is a fact of prime importance in using a counter. Unless the gamma ray emitters are present in their appropriate amounts, the counter cannot give an accurate measure of the uranium present.

Under what conditions, then, are the gamma ray emitters present in their appropriate amounts? When the material tested is in radioactive equilibrium.

What is meant by radioactive equilibrium?

When uranium is freshly purified and isolated from its radioactive daughter elements, it immediately starts to decay and re-form its daughter elements. As time passes, all the elements in the decay series gradually accumulate. Finally after about 1-million years, each element is present in such amount that it decays at the same rate as it is produced, and therefore no further change takes place in the quantity of any daughter element. The series is then said to be in radioactive equilibrium. When uranium ore is in equilibrium, a certain proportion of each daughter element is present, whether the ore contains 0.1% uranium or 50% uranium. At equilibrium each gamma emitter is present in its appropriate amount and the radioactivity measured by a counter is dependent on the amount of uranium present; hence a counter reading can provide a reliable indi-

Table I
Rate of Radioactive Decay

Time	Original Isotope Present Percent	Decay Product (s) Present Percent
0	100	0
1 T	50	50
2 T	25	75
3 T	12.5	87.5
4 T	6.2	93.8
5 T	3.1	96.9
6 T	1.6	98.4

Table II
The Uranium Series

Element	Radiometric Designation	Half Life	Radiations (mev.) Alpha	Beta	Gamma
Uranium-238	UI	4,550,000,000 years	4.21		
Thorium-234	UX_1	24.1 days		0.13	0.09
Protactinium-234	UX_2	1.1 minutes		2.32	0.80
Uranium-234	UII	269,000 years	4.75		
Thorium-230	Ionium (Io)	82,200 years	4.66		
Radium-226	Radium (Ra)	1,600 years	4.79		0.19
Radon-222	Radon (Rd)	3.8 days	5.49		
Polonium-218	Radium A (RaA)	3.1 minutes	5.99		
Lead-214	Radium B (RaB)	26.8 minutes		0.65	
Bismuth-214	Radium C (RaC)	19.7 minutes		3.15	1.8
Polonium-214	Radium C′ (RaC′)	.0002 seconds	7.68		
Lead-210	Radium D (RaD)	22.2 years		0.025	0.047
Bismuth-210	Radium F (RaF)	139 days	5.30		
Lead-206	Radium G (RaG)	Stable			

cation of the uranium contained in the ore.

To understand the mechanism by which uranium reaches equilibrium with its daughters, it is necessary to examine in more detail the members of the uranium series (Table II). Uranium-238 is the most inactive radioactive member of the series. Its half-life, 4.55-billion years, is longer than the geological age of the earth (about 3-million years), and hence it follows that less than 50% of the uranium-238 originally contained in the earth has disintegrated since the earth's origin. Since uranium-238 decays extremely slow, freshly prepared uranium metal is only slightly radioactive.

Because of its very long half-life, uranium-238 decays at an essentially constant rate and hence its daughter product, UX_1, is produced at an essentially uniform rate. UX_1 in turn decays to form UX_2, and after five half-lives (121days), 96% of the UX_1 initially formed from purified uranium-238 has been transformed into UX_2. Thereafter UX_1 decays approximately at the same rate as it is created (Fig. 2) and is in equilibrium. Because of its short (1.14 minute) half-life, UX_2 decays shortly after it forms and hence only a few minutes are required for UX_2 to accumulate in equilibrium amounts. Therefore, 121 days after crystallization of purified uranium metal, its first two daughters, UX_1 and UX_2, approach radioactive equilibrium and the quantity of UX_1 and UX_2 present remains approximately constant thereafter, their rate of production equaling their rate of decay. As the gamma-emitters UX_1 and UX_2 accumulate during the 121-day period, the radioactivity of uranium-238 steadily increases.

UX_2 is followed by U_{234} (UII), which has a half-life of 269,000 years, considerably longer than the life of any isotope following it in the series. The succeeding isotopes from ionium through lead can form no faster than U_{234} is produced, and for this reason its rate of accumulation controls the rate at which its successors can form. After UX_1 and UX_2 achieve equilibrium, U_{234} is formed at a constant rate. In order that U_{234} achieve equilibrium, sufficient time must elapse so that the U_{234} initially formed by the decay of purified U_{234} is completely disintegrated; thereafter, the rate of disintegration equals the rate of production. After four half-lives, about 1-million years, 94% of the initial uranium-234 has been destroyed and it is in approximate equilibrium. The shorter-lived isotopes after uranium-234 reach equilibrium approximately as it does. This figure—1-million years—is a convenient figure to represent the time required for the uranium series to attain equilibrium.

After uranium-234 is formed it decays to yield thorium-230 and radium. Radium in turn yields six isotopes of short life:

	Half-Life
Radon	3.8 days
RaA	3 minutes
RaB	26.8 minutes
RaC	19.7 minutes
RaC′	.0002 seconds
RaC″	1.3 minutes

About 30 days are required for the gas radon to achieve equilibrium, after radium is formed, and the five short-lived isotopes following radon achieve equilibrium within a few minutes thereafter. Among these five is RaC, the most powerful gamma-emitter of the entire uranium series. Freshly purified radium has only a limited gamma activity, but its radioactivity steadily increases with the accumulation of radio and its daughters through a period of 30 days, during which radon, RaA, RaB, RaC, RaC′, and RaC″ achieve equilibrium.

Following RaC″ in the decay series are RaD, RaE, RaF, and, finally the stable lead isotope RaG (lead-206).

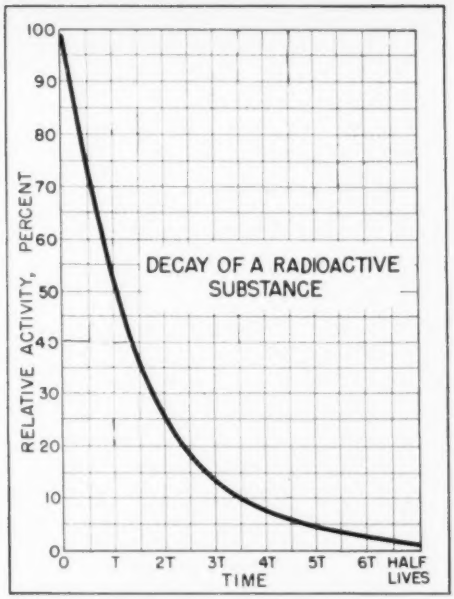
Geologic Problems

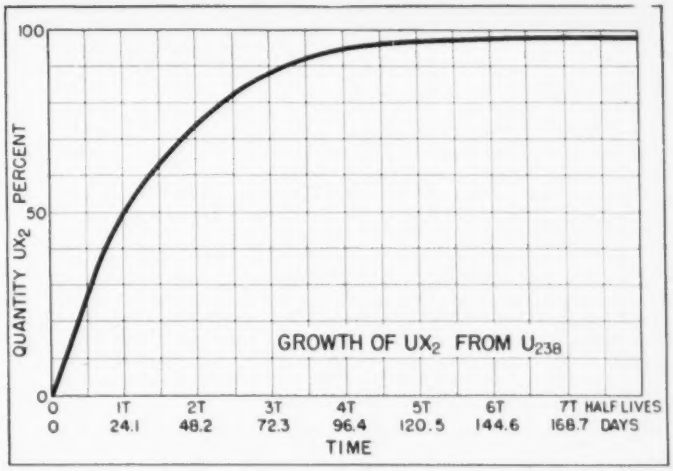
Of the many elements in the two uranium series, only the two parent isotopes, uranium-238 and uranium-235, are of direct interest as raw materials for atomic energy. In nature the two are always found together in constant proportion. Since uranium-238 is the more abundant, by a ratio of 142 to 1, uranium ores are priced according to the uranium-238 content, expressed in terms of the oxide U_3O_8. However, most ores also contain the many members of the uranium-238 and uranium-235 decay series. Although these daughter products are not used for atomic energy, they are responsible for many phenomena of significance in the geology of the ores. These cannot be discussed fully here, but the following effects can be mentioned briefly:

1. Effect of radioactive equilibrium upon geiger counter measurements.

2. The effect of radon.

Effect of radiometric equilibrium. As discussed above, about





AFTER 5 HALF-LIVES (121 days) 96% of the UX_1 initially formed from uranium 238 has been transformed into UX_2. Thereafter UX_1 decays at approximately the same rate it is created.

◀—EACH HALF-LIFE sees a definite loss of radioactivity.

1-million years are required for all the radioactive daughters of uranium-238 to accumulate in equilibrium amounts, and after that period of time the amount of each present does not vary, unless the elements are selectively attacked by chemical agents. At equilibrium, the radioactivity of a uranium compound is directly related to the uranium content of this material. All radiometric assaying of uranium ores is dependent upon this principle, and therein lies the main source of inaccuracy in radiometric assays, whether performed in the field or in the laboratory. If the ore is not in radioactive equilibrium, the radioactivity is not directly proportional to the uranium content and any assay made by counter is incorrect. Only a chemical assay is correct regardless of equilibrium conditions.

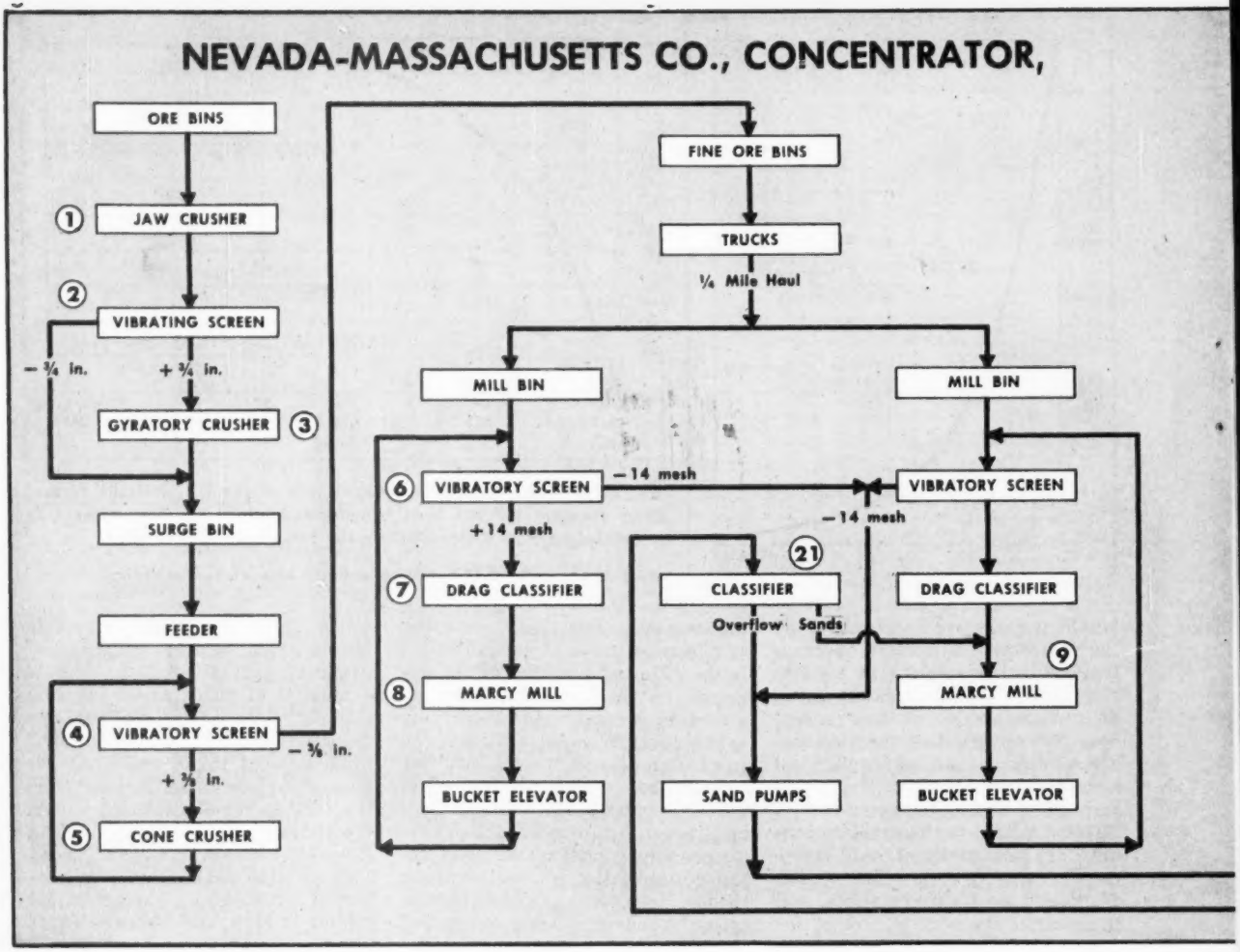
There are two chief causes for radioactive inequilibrium in uranium ores. First, the uranium minerals may be less than 1-million years old. Most secondary uranium minerals—such as autunite, schoreckingerite, torbernite, and uranophane—are out of equilibrium for this reason. They are usually the products of recent weathering of pitchblende and are found in the oxidized portion of a uranium deposit. They were formed less than 1-million years ago and hence the daughter products of uranium—particularly the strong gamma source RaC—have not yet accumulated in their appropriate amounts. Accordingly, a radiometric assay of such material is usually too low, the uranium content is greater than the amount of radioactivity indicates.

A second cause of inequilibrium is the differing response of the elements in the uranium series to attack by ground water. According to their respective solubilities in the particular ground waters involved, the various elements are leached at different rates from uranium ores and inequilibrium results. Such reactions are complex and little detailed information is available about them. However, a characteristic type of leaching is being recognized in the oxidized portions of sulphide-bearing pitchblende deposits. Here the ground water of the oxidized zone is predominantly acidic, due to the oxidation of sulphide minerals and the formation of soluble sulphates. In such solutions the solubility of uranium is higher than that of radium. Accordingly, uranium tends to be leached from the ores and removed by solution, whereas the radium tends to remain in place. Radium is continuously forming RaC and hence the gamma activity of the leached material remains high. A radiometric assay of such material is unduly high; the uranium content is less than the radioactivity indicates.

Experience has shown that the following uranium ores are usually in equilibrium—carnotite ores, unweathered pitchblende ore, asphaltic uranium ore. The following materials are usually *not* in equilibrium—secondary uranium minerals, radioactive coatings on mine walls, radioactive spring deposits.

Effects of radon. Being gaseous, radon is responsible for certain effects which the other daughters of uranium cannot produce. Minute quantities of radon are being continually released from rock surfaces due to the trace amounts of uranium present in all rocks. At the ground surface, radon released from the rock is rapidly diffused within the atmosphere and its effect is lost. However, within confined places, such as mine workings, the proportion of exposed rock surface to air volume is high, and here the effect of radon and its daughters is significant, particularly if the rocks are unusually radioactive. The concentration of radon increases with rock blasting, drilling, or any other activity which produces new rock surfaces and fractures from which radon can escape. Because of its high specific gravity, radon tends to accumulate in the lower parts of mine workings.

Radon itself is an alpha-emitter and does not produce gamma radiation. For this reason, geiger counters do not detect radon directly. Rather, it is the solid daughter products of radon—particularly RaC—which primarily affect the counter. These radioactive products may adhere to dust particles and remain suspended in the air, or they may collect on exposed surfaces of any type. When these products collect on clothing, it remains radioactive for several hours after removal from a mine. In the same way deposition of these radioelements on a geiger counter causes its reading to be irregular and unreliable for several hours.



Improved Flowsheet Increases Recovery

SUTTON NO. 1 MINE was rehabilitated last year by Nevada-Massachusets Co. after 10 years of idleness. Orebodies at Sutton No. 2 have been developed for underground operation and daily output is 400 tons of tungsten ore.

PROBLEMS IMPOSED IN HANDLING lower grade ores at Nevada-Massachusetts Co.'s 400-ton concentrator at Tungsten, Nev., have been responsible for an improved flowsheet. Among the benefits realized are:

(1) Increase in overall recovery by reducing overgrinding to a minimum, recovering as much scheelite as possible at a coarser size, recovering free scheelite in the middling cuts of the tables, and preparing a better table feed through better sizing.

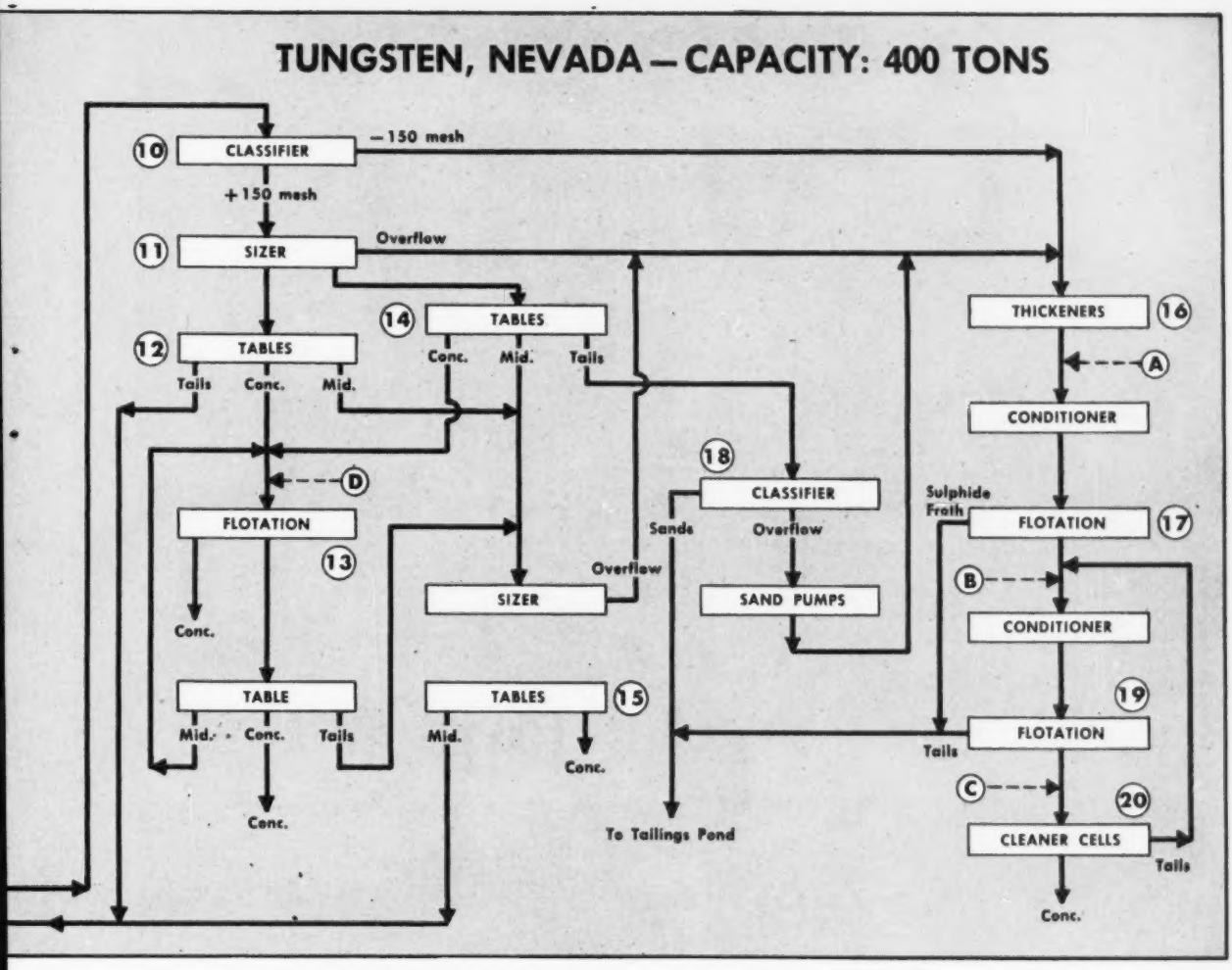
(2) Slightly higher tonnage through more efficient grinding.

(3) Somewhat lower operating costs because of smaller tonnage going to flotation, using less reagent, and because lost time and maintenance costs can be reduced by more stand-by equipment.

From 65 to 70% of the scheelite will now be recovered by tables, the remainder by flotation. This is almost the reverse of previous practice.

Among the problems the new flowsheet had to solve, was the tendency of scheelite to slime in grinding, thus cutting recovery. In view of this, it was logical that company engineers study and test screening methods to remove undersize as soon as liberation

TUNGSTEN, NEVADA — CAPACITY: 400 TONS



and Mill Capacity

is effected. Results of these studies were incorporated in the new flowsheet.

Run-of-mine ore obtained from limestone beds occurring at Tungsten is a medium to coarse-grained aggregate of quartz, garnet and epidote, with scattered crystals of scheelite. Some high-grade ore consists of scheelite crystals embedded in glossy quartz and fine-grained epidote. Tungsten content varies from 0.25% to 3%. Currently about 75% of the ore treated at the concentrator comes from underground operations, the rest from open pits.

Important change at the crushing plant was the addition of a 4-ft. Symons cone crusher in a closed circuit with a Symons vibrating screen to provide three-stage crushing to produce a ⅜-in. mill feed.

In the concentrator, through careful control of reagents and pH (10 to 10.1), 12 to 13% of the calcite content of the ore is rejected.

Final concentrates are graded up to plus 75% WO_3: Gravity concentrates by roasting and magnetic separation; flotation concentrates by acid treatment.

W. H. Emminger is general superintendent, and P. McGuire, mill superintendent.

LEGEND

1. 24 x 26-in. Allis-Chalmers jaw crusher.
2. 3 x 8-ft. vibrating screen.
3. 3-ft. Traylor gyratory crusher.
4. 4 x 8-ft. Symons vibratory screen.
5. 4-ft. Symons Short-Head cone crusher.
6. 3 x 10-ft. Tyrock vibrating screen.
7. Drag classifier for removal of chips.
8. Marcy 66 ball mill
9. Marcy 64½ ball mill.
10. 8 x 21-ft. Dorr classifier.
11. 14-pocket sizer.
12. Three No. 6 Wilfley tables.
13. Three-cell Kraut flotation machine.
14. 11 Concenco tables.
15. Two Wilfley tables.
16. Two 42-ft. Dorr thickeners.
17. Six Agitair 36-in. flotation cells.
18. 6 x 25-ft. Dorr classifier.
19. Eight Agitair 36-in. flotation cells.
20. Four Denver cleaner cells.
21. 4 x 20-ft. Dorr classifier.

A
Soda ash
Cresylic acid
Kerosene
Xanthate

B
Sodium silicate
Quebracho
Oleic acid
Sodium cyanide

C
Sodium silicate
Fresh water

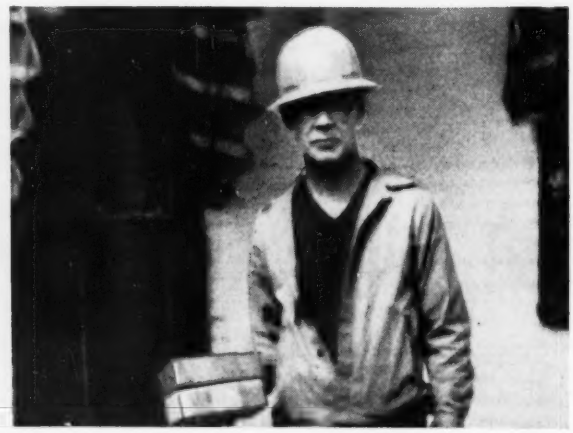
D
Cresylic acid
Xanthate

ESTANISLAO CORONADO, in one of the company's plants in Mexico, was working in a furnace pit when a 300-lb. piece of hot slag fell from the side of the settler onto his hard hat, forcing it down and breaking the headband and cradle. He was uninjured, though dazed.

AGAPITO ACOSTA was removing trolley line posts on the tracks. An angle bar snapped off, fell on his hard hat, piercing it, but causing only a slight cut on the crown of his head. Agapito was knocked out for a few seconds, but went back to his regular job within the hour.

The Safety Hat Pays Off

ARNOLD BOND, mechanical superintendent at another plant, always an advocate of hard hats, was standing near crushing rolls, as shown. A steel chute liner weighing several pounds fell and struck him on his hard hat. He suffered a stiff neck, but had no other ill effects.



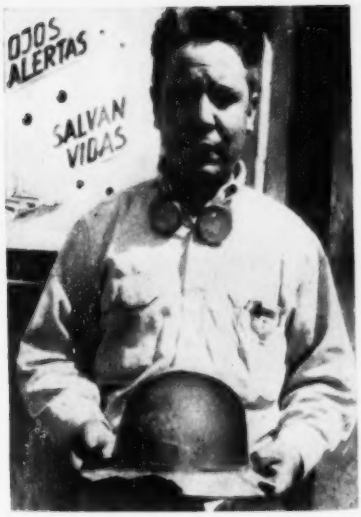
J. KROCHER jarred a scaffold upon which 15-lb. tile were stored. One of the tile, falling 10 ft., struck him on the hat. He suffered no ill effects and the hat was undamaged. The practice at this plant of having masons and their helpers wear hard hats prevented an accident.

R. C. BECKSTEAD, Director
Safety and Technical Employment,
American Smelting and Refining Co.

SEVERAL PLANTS of the American Smelting and Refining Co. have voluntary programs involving the wearing of hard hats by wage-roll employees as well as by members of supervision and management. Started several years ago, this program has gradually gained momentum, largely through education and the publicizing of accidents which were definitely prevented by the wearing of hard hats.

Hats are supplied by the company at no cost to the employees. In cold weather, liners are also furnished. To encourage the practice of wearing the hats, they are inspected at regular intervals, at which time they are completely serviced, washed with a good disinfectant, and returned to the employee for his next scheduled shift.

In any safety program involving the use of protective equipment, it is always easy to know what should have been done after an accident happens. The important thing is to have the equipment in



JOSE ESPARZA, plant foreman, was checking water flow in a machine, with his head inside the door. An assistant accidentally closed the door, striking him on the head. The hat was broken apart at the rim. The foreman was cut on his forehead and shaken severely, but otherwise uninjured.

A. CHENKOVICH was supervising the lowering of a shield into position in front of a settler when a 6-ft. pipe, ¾-in. in diameter, used to steady the upper part of the shield, broke loose, fell 7 ft. It struck him directly on his hard hat. The hat was cracked, he was quite uninjured.

WILLARD I. SISCO'S hat has a piece knocked out of it. He was working in the converter aisle near a power shovel. As the shovel swung around, it struck him on the side of his hat, pinning him against the skimmer's platform. The hat prevented him from getting a serious head injury.

ELIZANDRO MOLINA, assistant foreman in drossing plant, was removing crust from a lead kettle with sledge. The head flew off, striking him on his hat, breaking its rim and making it useless. Mr. Molina suffered only a small concussion on the left temple.

PATRICK CUNNINGHAM points to a gouge in his hard hat, caused when a 20-lb. angle iron fell 10-ft. endwise, with enough force to crack the crown of his hat. Mr. Cunningham said he probably would have been killed, had he not been wearing the hat.

AL FRICK was struck by a 9½-lb. piece of scrap steel, falling 50 ft. from a walkway above. The piece ricocheted off his hat, causing a small flesh wound on his shoulder. The investigators concluded that the hard hat prevented a fatality.

use before the accident occurs. Throughout our operations we have had several instances in which we know that the use of a hard hat has prevented serious injury and a possible fatality. Ten such cases are here described.

In each case, if the employee had not been wearing his hat, the cost of the accident would have exceeded the entire cost of the hat program for the plant where he worked.

It is evident from the case histories presented that our hard hat program has been very good insurance for the workmen in preventing serious injury to them. Everyone concerned with our programs of head protection, including workmen and supervisors, has been very cooperative in making the program effective. The attitude has spread throughout our plants that it is much easier to tell how an accident was prevented than to take action to prevent the accident after it has happened.

KEEPING TAB ON PRACTICE

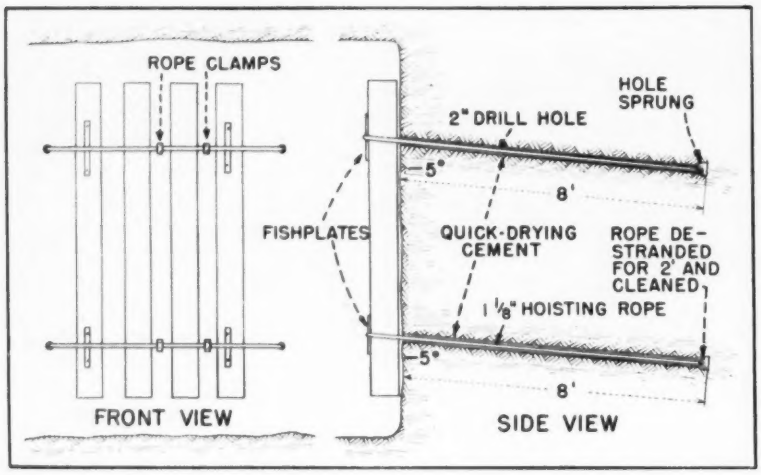


FIG. 1. SHORT STEEL BOLTS are replaced by wire rope to hold rock that would otherwise slough from wall. Four-hole pattern is generally used. Holes are drilled at minus 5 deg., and filled with cement. See also Photo 1.

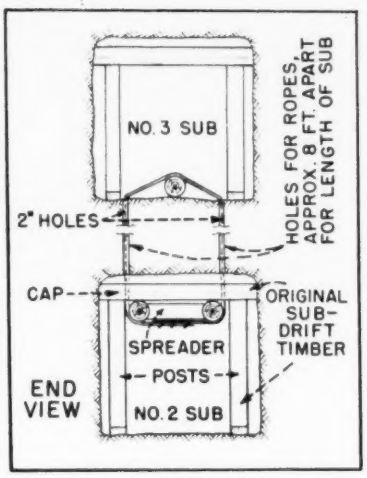
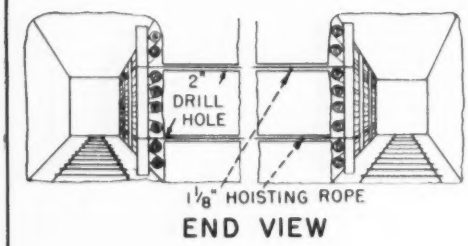


FIG. 3. STRINGERS, seen in Photo 3, and wire rope holding ground between sub-drifts, are shown here in end view.



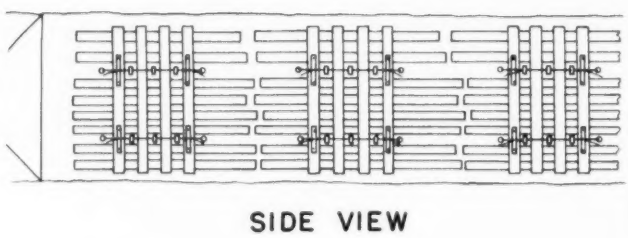
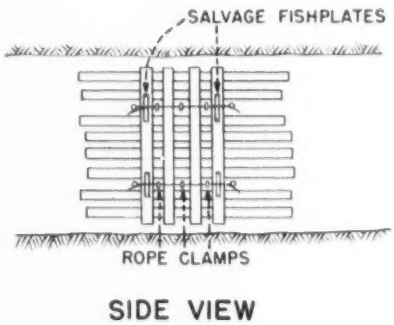
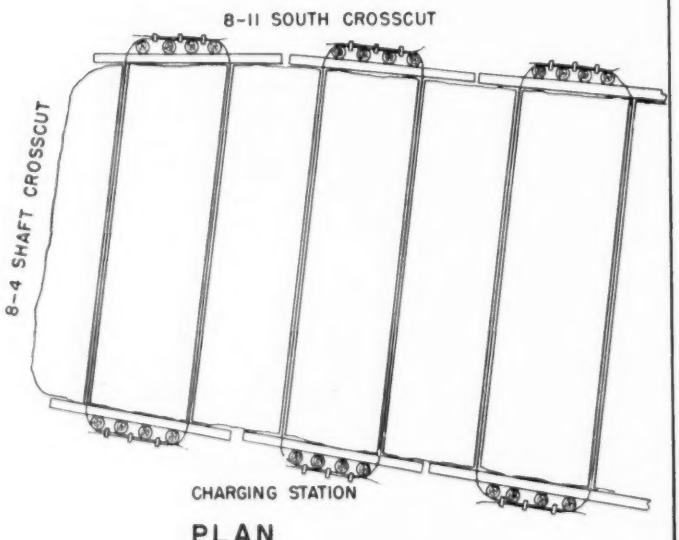


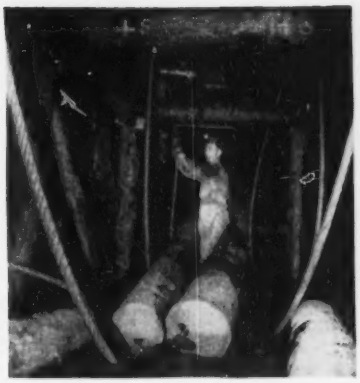
FIG. 2. PARTIALLY-FAILED PILLARS are also being held with wire rope and lagging, so that they render service intended. Lagging is used on both sides of pillar. See Photo 2.





1. WIRE ROPE AND LAGGING keep wall rock from sloughing, as in Fig. 1. Lagging is blocked and wedged, after ropes have been cemented in holes.

2. PILLARS THAT HAVE FAILED almost completely are being held with rope (pulled tight and clamped) and lagging, as shown here and in Fig. 2.



3. LOOSE GROUND BETWEEN SUB-DRIFTS, one vertically above other, is tied together by wire rope, run in vertical holes. See Fig. 2.

Replacement of Rock Bolts With Used Hoisting Rope Cuts Cost of Holding Ground

R. S. HAFLIDSON, Mine Superintendent, E. S. SHORT, Assistant Mine Superintendent, A. GAUTHIER, Captain, A. R. GRIEVE, Captain
East Malartic Gold Mines, Norrie, Quebec

EAST MALARTIC GOLD MINES, LTD., operating in northwestern Quebec about 50 mi. east of Noranda, has been mining gold-silver ore continuously since 1938, when production started. At present, production consists of 1300 tons of medium-grade ore per day. The main, or central, ore zone from which most of the output has come, is located in a shear zone lying along a greenstone-greywacke contact.

The greenstone, which lies to the north, is very incompetent, being highly sheared and talcose. In no case will it stand unsupported. In the past, supporting this greenstone has presented a continuous problem in mining because it represents the north waste wall of the main ore zone. Many different methods of using timber, concrete and steel have been tried. Over the years this has been costly because in almost every case it has been necessary to timber and retimber, perhaps many times. Despite the expense, this timbering to date has proved to be the cheapest way of holding the greenstone. All other methods, including rock-bolting, have been either too expensive or ineffective.

South of the contact, the greywacke, in contrast to the greenstone, is fairly competent, despite the fact that near the shear zone it is blocky and shows a strong tendency to fail in a vertical plane. Rock bolting has been highly satisfactory in the greywacke, due to its hard, though blocky, nature. However, a cheaper substitute for rock bolting has been found in the employment of used wire hoisting rope, as told in the following paragraphs:

The Change to Hoisting Rope

Most of the rock bolting practiced by East Malartic in the greywacke has been done in the main haulageways, where horizontal bolts served to keep the walls from sloughing into the drift. As the amount of bolting necessary to maintain the haulageways and sub-drifts throughout the mine increased, the expense became considerable. This, with the threat of a steel strike which up to then had not taken place, caused the East Malartic management to consider the possibility of finding cheaper methods of holding the greywacke effectively. Substitution of used hoisting cable for rock bolts was suggested. Such cable was being discarded as a rule, or, in the case of ropes of bigger diameter, destranded for use on slushers.

Several problems had to be solved before this substitution could be made. When the difficulties were overcome, it was found that the rope not only replaced the bolts satisfactorily but, due to its flexibility, could be used in many ways in which the bolts were not practical.

Three methods have been found by East Malartic to be the most satisfactory for holding ground in the workings in greywacke. They are as follows:

The first method applied was to replace the use of steel in short bolts. In this method, shown in Fig. 1, holes are drilled at minus 5 deg. from the drift through the loose ground into the solid, the distance depending on the rock conditions. These holes are ordinarily 2 in. in diameter, drilled with tungsten-carbide bits by 3½-in. leyners. Where necessary, extension steel equipment is used. The hole pattern usually follows Fig. 1, two lower and two upper holes being drilled to form a four-hole rectangle.

When the holes have been drilled, the bottoms are sprung with approximately 2 oz. of Forcite gelatin. The wire rope is cut into lengths which are unravelled on one end for 2 ft. and cleaned with turpoil. They are then tied on the end with light string. A 12-in. by ⅝-in. spike is inserted for the purpose of breaking the string, allowing the rope to expand in the bottom of the hole, once it has been introduced and driven to bottom. The 1⅛-in. rope generally used is very stiff.

The wall is then lagged as in Photo 1 and sprags (braces to the opposite wall of the drift) are inserted to hold the cables and lagging in place. Quick-setting cement is now mixed with fine sand, approximately two parts of cement to one of sand, into a thick slurry and introduced into the hole. The hole being drilled at minus 5 deg., the cement runs to bottom and the hole is easily filled to the collar. When the cement has set, the sprags holding the

lagging and wire rope are removed and the lagging blocked and wedged tight.

On all occasions where wire-rope lengths have been used instead of rock bolts, they have been found as satisfactory as the bolts in every way and at much lower cost. As other rock-holding problems presented themselves, this method was gradually used for other purposes, such as for holding partially-failed pillars.

In this application, holes are drilled through the pillar usually 6 to 8 ft., as in Fig. 2, using 2-in. tungsten-carbide bits and extension steel equipment. The cables, previously cut to length, are introduced as quickly as possible to prevent blocking of the hole with caved rock. Lagging is then placed as in the first method on both sides of the pillar. Cables are now pulled tight with the aid of chain blocks and clamped; finally everything is blocked and wedged as tight as possible.

This, with experience, has proved an extremely good method of holding pillars even when they have almost completely failed. In addition, sloughing into the drift is prevented. See also Photo 2.

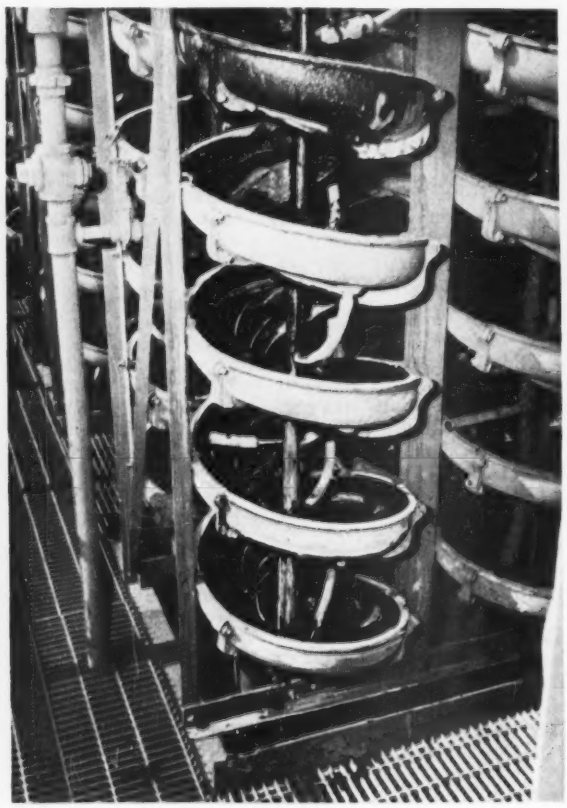
This principle is applied in a vertical manner in tying loose ground together from one sub-drift to the other above. This is accomplished by drilling vertical holes in pairs, approximately 8 ft. between pairs, from one sub-drift to the other. This was done, as before, using carbide bits and extension steel. In this case the holes are drilled vertically up. Wire ropes introduced from the sub above, pulled tight with chain blocks and clamped, support stringers which in turn are supporting drift sets already in place.

Photo 3 shows this method of holding backs at the stage in which cables are being introduced from the sub-drift above. The stringers remain to be raised and the cables have yet to be clamped and blocked. Fig. 3 shows an end view of the completed job.

The three methods, as outlined, of holding ground with wire hoisting rope have been in use by East Malartic for slightly under a year. Effectiveness is indicated by the fact that present consumption of used rope is approximately 3,000 ft. per month. We have no hesitation in recommending this practice for any mine with comparable conditions.

Acknowledgement

We wish to acknowledge the assistance of J. Evans, chief engineer, and other members of the mine staff in the preparation of this article. Thanks are also extended to T. V. Nethery, manager, for helpful criticism in preparing the manuscript.



THE FIRST STEP. The cast-iron spirals to be lined with Neoprene are first sand-blasted to obtain clean and smooth surface, free of all rust. Cleaning is done in an open area.

Special Linings Successful with Abrasive Sands at Trail Ridge Plant

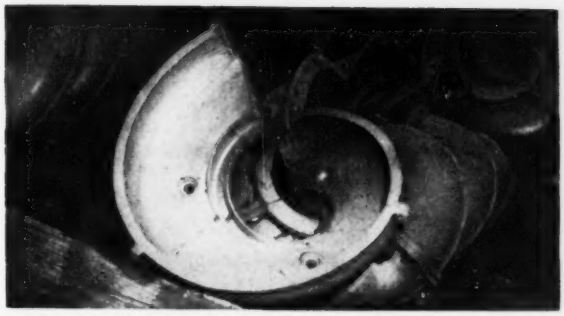
NO WEAR after several months of service is shown by this section of rougher spirals lined with sheet Neoprene. Several steps are involved in putting these linings in.

HUMPHREYS GOLD CORPORATION is conducting two dredge mining operations in Florida for the recovery of rutile, ilmenite, zircon, and monazite from ancient beach deposits. One of these mines is near Jacksonville, and the other is near Starke. The mine at Starke, known as the Trail Ridge plant, is producing titanium minerals for E. I. duPont de Nemours & Co. and also produces zircon which Humphreys sells for its own account. (See May 1952 issue of *E&MJ*).

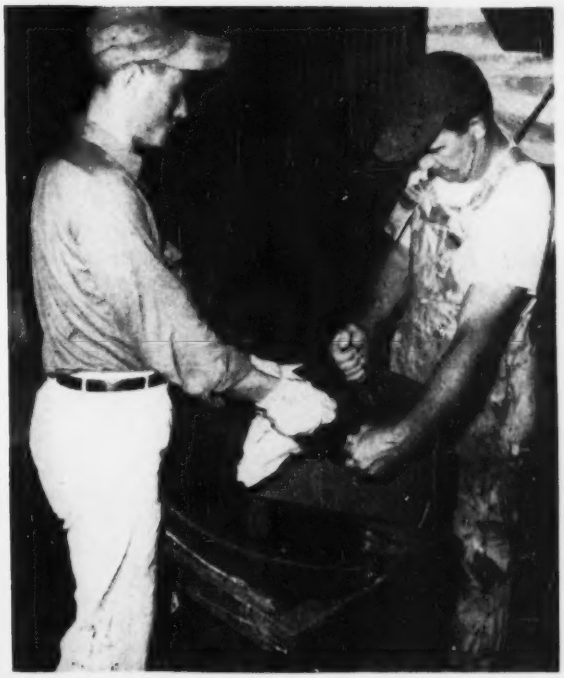
The sands of the two deposits are similar, although the particle size averages slightly larger in the Trail Ridge deposit. Sand grains are not angular, but rounded as the result of water and aeolian action in the formation of the deposits. Probably because of acid water conditions and different particle size and shape, however, the wear of pump parts, pipe lines, sumps, Humphreys spirals and other metal equipment has been much greater at the Trail Ridge plant.

For example, while the spirals at Jacksonville have required no replacements in more than eight years and are still in good operating condition, replacement of some spiral sections at Trail Ridge was necessary after a year and a half. Pumps and other parts in the Trail Ridge sand flow lines suffered similarly.

The successful substitution of hose



THE GROOVES which have been cut into outer surface of spiral can be easily distinguished after sandblasting.



LINING IS FITTED into spirals and rolled to smoothness with hand metal roller and the various joints sealed smooth.

SHEET NEOPRENE is cut to give form-fitting surface. Several coats of cement are sprayed on before installing.

JOINTS ARE SMOOTHED before sending spirals to curing room. This is done on racks after installing lining.

for pipe and of rubber-lined pumps for metal pumps led to wider use of rubber.

The engineering division of the Humphreys Investment Co., Denver, which makes the Humphreys spiral concentrator, developed a molded rubber-lined spiral section and also spiral sections of Ni-hard and of white iron which have now been in use for a considerable period in several plants handling abrasive materials. How long they will last in their respective uses time must determine.

At the Trail Ridge plant the wet mill consists of 704 rougher, 264 cleaner, and 132 recleaner spirals to provide three stages of concentration. Of these, the 704 rougher spirals wore rapidly and a procedure of reconstruction of the spiral sections at the plant was developed. This procedure, because of the very large number of sections, was deemed more economical than replacement by new molded rubber-lined spiral sections. In spiral plants of much smaller size, however, it would be more economical to purchase the molded rubber-lined sections.

The wet mill feed is about 1550 long tons per hour, which is about 65% new feed, the remaining 35% being the recirculation of rougher middlings and tailings from the cleaner spirals.

The standard Humphreys spirals are made of cast iron, trough-shaped sections, so designed that when assembled they form a helix of five turns. Feed is from the top and the flow is by gravity down the spiral.

Sand and water from the feed are carried to the outer section of the trough and along this path is the greatest amount of wear.

Spiral sections are removed from the frames and sandblasted with staurolite, which happens to be one of the plant by-products, to obtain a clean surface free of all rust.

The sections are then treated with several coats of a rubber primer and rubber cement to restore the original contour of the spiral. After curing and applying more primer and cement, Neoprene liners, ⅛ in. thick, are cut and fitted into the spiral trough using a metal roller to obtain smoothness. Final treatment is given in a curing room where the spirals remain at an elevated temperature for about 20 hours.

It is expected that the ⅛-in. thick sheet Neoprene lining will last four to five years, based on present rate of wear. This is in sharp contrast to the cast iron in which deep grooves were cut in about 18 months.

The plant has met with a high degree of success in the use of rubber-lined pumps in certain installations. It now has seven in operation and is

arranging to install 11 more pumps.

At present there are about 7½ mi. of rubber and Neoprene tubing and hose throughout the plant. These range in size from 1½ in. to 8 in. in diameter, and have been installed as replacement for pipe lines and small launders.

The rubber tubing is supported in angle-iron racks or used as liners for pipes to carry streams flowing by gravity. High-pressure hose is used to replace pump lines whenever possible. The larger launders are lined with ¼-in. rubber sheet bolted in place.

The Trail Ridge plant deposit tests only about 4% heavy mineral, of which about 45% is ilmenite. The plant is producing at the rate of about 8500 tons of ilmenite per month. Zircon is also recovered, and equipment has recently been installed to recover staurolite from the ilmenite tailings before they are sent to the zircon mill.

COMPACTION is in progress using the Vibrofloat, which is suspended from crane and guided by vertical wooden leads. Four hoses shown carry power and water to the motor and water to the Vibrator. As compaction begins, clean sand is shoveled into the crater to make up the volume loss caused by the greater density of the ground.

Vibroflotation Process Used in Preparing Plant Site on Sand in Florida Phosphate Field

INTERNATIONAL MINERALS & Chemical Corporation and Rust Engineering Co. have collaborated in erecting in the Florida phosphate field a large plant on loose sand, using no piling or support other than the sand itself. The success of this practice is said to be due to Vibroflotation, handled by Rust under franchise. Vibroflotation, it is claimed, is a means of compacting soil effectively.

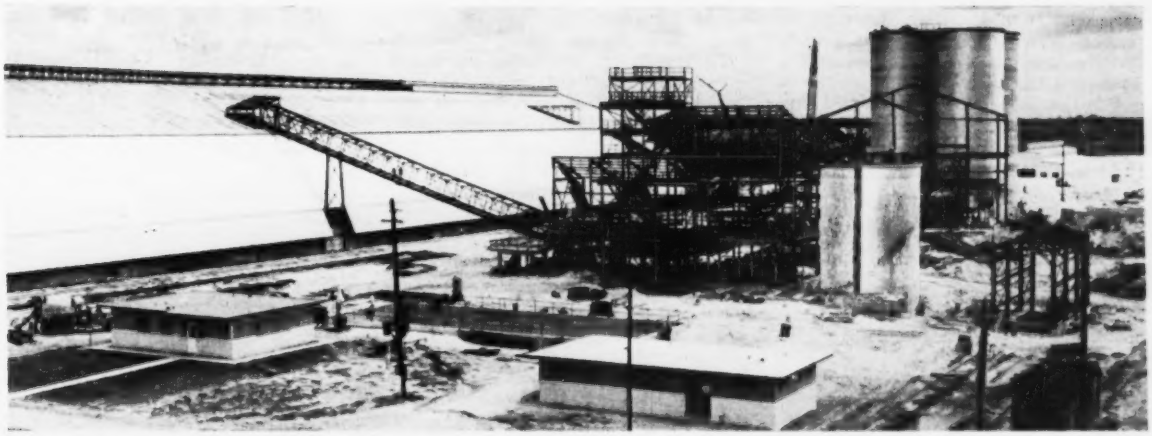
The inventor is Sergei Steuerman, who first used the process in Germany, later in the United States. Large-scale application had to wait until early in 1951, when International Minerals began surveying for a site for its Bonnie phosphate chemicals plant. The site was finally selected near Mulberry.

A report on this area found present "very loose sand that is highly susceptible to large volume changes when subject to vibration or sudden shock" in depths of 10 to 15 ft. Below this lies about 15 ft. of a "sandy matrix stratum" that contains traces of well compacted reddish brown and yellow clay. A third layer of sand and gravelly clay, somewhat compressible, extends fully 20 to 30 ft. further down.

In this district Rust had previously driven H-shaped steel beams or piles for 104 ft. without meeting sufficient resistance to support nominal loads.

Vibroflotation had been investigated. Local conditions favored it. Adoption was assured when Thomas M. Ware, International's vice president in charge of engineering, supported the proposal. In October, 1951 the work got under way.

Of the 1½-million sq. ft. building site, an area of 160,000 sq. ft. had to be compacted.



BUILDING SITE for International Minerals' Bonnie phosphate chemicals plant in Florida is approximately 1½-million sq. ft. in area. Of this 160,000 sq. ft. had to be compacted before the new plant was built.

Building Sand Columns Beneath Surface

The process consists in shaking and pushing sand into a tighter mass in depth. Individual sand particles are rearranged so as to obtain the smallest open space between them.

Compaction is effected by a tubular instrument, 15 in. in outside diameter and 25 ft. long, called the Vibrofloat. It contains a motor and an eccentric or unbalanced weight in its 6-ft. lower section. This Vibrator, as it is called, is attached to a follow-up pipe about 12 in. in diameter housing water and electric lines and extending the remaining 19 ft. The whole is hung from a crane and guided by vertical wooden leads.

Two of these machines, one built by Baldwin Locomotive Works and the other by a local contractor, were used. Each weighs about 5,000 lb. and generates a 10-ton centrifugal force when the eccentric is revolving at full speed.

In operation, the Vibrator, positioned by the crane, is allowed to obtain full speed above the spot to be compacted. A water jet at its tip is opened, forming a pool and saturated mass of soil. With the jet still playing, the unit "dives" of its own weight into this saturated sand while its vibration and the water being forced upward around it create a momentary "quick sand" condition. In this the Vibrofloat rapidly disappears—while driving sand by centrifugal force out of its path into the wall of the funnel opening around it.

After the machine reaches the desired depth (at Bonnie this is the depth of the matrix or about 12 to 16 ft.), it is halted. Water flow is transferred from the bottom jet to vents at the top of the Vibrator, from where it runs downward along the sides. This carries down additional sand for compaction into the sand wall against which the Vibrofloat is now pounding 10-ton hammer strokes every 30th of a second.

A crater 3 ft. in diameter forms at the top of the hole as sand sucks downward along the vibrating cylinder. Workman speed the process by rapidly shoveling fresh sand into it which vanishes in turn. Meanwhile, as sand packs tighter in the hole, more and more current is required to keep the motor hammering at full speed. When the ammeter in the cab shows amperage increased to a certain point, the bottom level where the Vibrofloat is pounding is considered compacted to the desired density. The machine then is lifted 1 ft. At the new position it pounds away, packing solidly beneath it as well as into surrounding walls the sand that is fed down by the shovelmen, until the amperage again rises to the critical point. Then again the Vibrator is raised another foot, and so on in 1-ft. stages until the "column" of compacted sand has been built up to the desired foundation level or to grade.

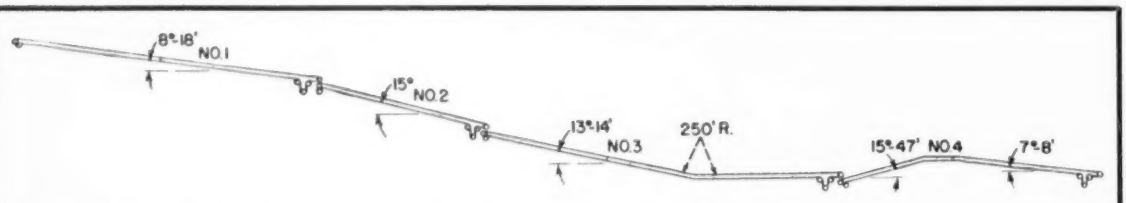
EFFECT OF COMPACTION in area treated by Vibroflotation is shown in wall of test pit dug by clamshell. Dark sand indicates original soil. White sand is the clean sand added during compaction.

The operation takes 15 to 20 minutes for a single compaction. In that period an average of 2½ cu. yd. (or small truck full) of sand is added to the soil at each compaction point. This means that 67½ cu. ft. of sand has been poured into about 13 cu. ft. of space temporarily occupied by the Vibrofloat. The result is a column of sand 10 ft. in diameter which has been compacted to a far higher than natural density. However, to make doubly sure of sufficient strength, these 10-ft. columns are overlapped, their centers being sunk within 8 ft. of each other according to a pattern staked out in advance. Great additional strengthening of the compaction results. Thus, under all loads to be supported, every 8 ft. marks the center of a compacted column of sand averaging 13 ft. in depth and with a relative density of 70 to 100%—more than enough to bear the weight and vibration to be encountered.

Upon these compacted columns of

sand, and as close to the surface as practical (3 to 4 ft.) widespread footers or concrete foundation mats were poured. The purpose was to spread the load (which presses down through the earth at approximately a 45 deg. angle) over as wide a range of the compacted area as possible, so that the load imposed on the clay layers would be negligible.

To date in the 20-FOS silos, which have been completed, negligible settlements have been recorded. If the buildings were placed on loose sand where vibrations are not present, allowable soil pressures of 2000 psi could be used. However, by putting the same structure on a sand compacted by Vibroflotation, the maximum allowable soil pressure could be increased to 6000 to 8000 psi.



FOUR BELT CONVEYORS compose the decline system used to transport Itabira ore from loading point to a point 400 ft. lower down.

Conveyor No. 1	Conveyor No. 2	Conveyor No. 3	Conveyor No. 4
Speed, 360 fpm	Speed, 360 fpm	Speed, 360 fpm	Speed, 360 fpm
Capacity, 960 tph	Capacity, 960 tph	Capacity, 960 tph	Capacity, 960 tph
Material, iron ore	Material, iron ore	Material, iron ore	Material, iron ore
894' centers—129' drop	500' centers—129' drop	1048' centers—142' drop	784' centers
Estimated power, 103.5 hp.	Estimated power, 114.5 hp.		Estimated power, 119.0 hp.

Downhill Belt Conveyor System Lowers Iron Ore 400 Ft. From Open-Cut Workings

DECLINE BELT CONVEYORS are rapidly becoming an accepted medium for conveying bulk materials from high-level mining areas to lower-level preparation plants, according to R. U. Jackson, of Robins Engineers Division, of Hewitt-Robins, Inc., at the 4th Biennial Materials Handling Conference in Buffalo, N. Y., Oct. 28-29.

The conference was sponsored by Westinghouse.

Such conveyors offer the advantages of continuous transportation, uniform discharge to the preparation plant, and a system that can be under observation at all times. The material load, moreover, rides stationary on the moving belt with minimum degradation.

At Itabira

A decline conveyor system for handling iron ore from the mine of Cia Vale do Rio Doce, Itabira, Brazil, was described by Mr. Jackson, among other installations. The total drop is 400 ft. The system is composed of four 36-in. belt conveyors having respective lengths of 894 ft., 500 ft., 1048 ft., and 784 ft. These conveyors handle the ore at a rate of 960 long tph, with a belt speed of 360 fpm. The estimated power varies from minus 103 hp. to minus 119 hp.

The ore comes to this system via a special feeder and tunnel conveyor located underneath a surge pile. Because its weight varies from 150 to 200 lb. per cu. ft., a Weightometer is provided. This is electrically interlocked with the variable speed drive of the feeder in such a way that when the ore runs light, the feeder is speeded and when the ore runs heavy, it slows down. By this means, the tonnage to the decline belt system is held fairly constant at 960 long tph. The same drive of 125 hp. has been provided for all four conveyors. Each motor is equipped with a thrustor-operated brake, a centrifugal overspeed relay, a centrifugal speed starting relay, a reduced-voltage, reactor-type, automatic, magnetic controller and the necessary protective features.

A main control station is located in the screening station which is fed by Conveyor No. 4 of the decline conveyors. This control is a complete floor-mounted, metal-enclosed, operator's cabinet, in which are flush-mounted push-button stations and red indicating lights for each unit, including the controls for the screening station units, the feeder and tunnel conveyor under the surge pile, as well as the four decline conveyors

Starting Up

After the operator receives his light signal showing the screening station units in operation, he starts Conveyor No. 4 and allows it to come up to full speed, at which time a red light glows on his board. This is his signal for starting No. 3 belt. When No. 3 is carrying no load, power is required for driving. In this case the start button energizes the brake contactor, which in turn energizes the thrustor motor and releases the thruster-operated brake. Two timing relays are also energized at this time through a brake contactor interlock and they are set for 6 and 12 seconds respectively. After 6 seconds, timing relay No. 1 closes its interlock which is in series with the start contactor which connects the starting reactor in the line and applies reduced voltage to the motor. Timing relay No. 2 has been set for 12 seconds and after that time, it closes its contact and connects the motor to the line. It is not intended, however, that timing relay No. 2 shall come into play under normal operating procedure and its timing, as well as the reduced voltage applied by relay No. 1, should be field-adjusted so that the centrifugal speed relay will act first. The latter relay, which is driven by the drive snub pulley shaft, also has its interlock connected in series with the run contactor on the starter.

When the conveyor has reached rated speed, this interlock closes, energizing the run contactor, and connects the motor to the line. This point of transfer will be made so near to synchronous speed that the transfer will be accompanied by a very low transient torque condition and this without adding any extra stress on the belt.

When Fully Loaded

When the conveyors are fully loaded, the start button energizes the brake contactor, thereby releasing the brake. The two timing relays are also energized at this time, but as they are set for 6 and 12 seconds and the fully loaded conveyor will come up to speed in 4 or 5 seconds, neither one will act, for the centrifugal speed relay will connect the motor to the line. Since the motor is up to synchronous speed, the closing of the run contactor will have no effect on the line conditions, so the motor proceeds to regenerate power.

When No. 3 conveyor is running at full speed, its red indicating light glows on the control panel and the operator pushes the start button for No. 2 and the same sequence is followed.

As a safety precaution against the possibility of a power failure, a second centrifugal speed relay protects the equipment against "run-away."

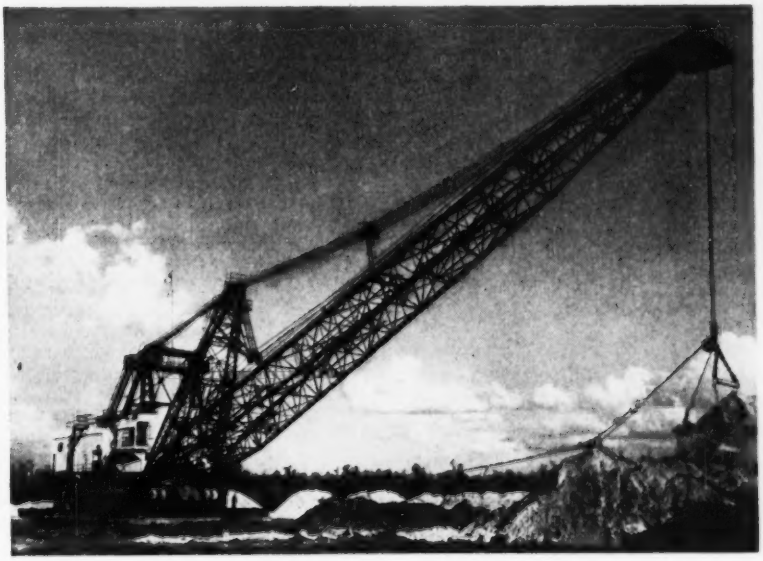
As a further safety measure, two limit switches have been provided on the thrustor brake of each slope conveyor to assure the setting of the brake before the motors are actually removed from the line. Since this is a regenerative system, the motor and conveyors would "run away" if removed from the line and the brake failed to set.

When Stopping

At the end of a day or shift, when operations are being stopped, the operator stops the feeder under the surge pile, then clears the system completely before leaving his station. However, contingencies do arise wherein part of the system must be stopped without clearing the belts, which requires stopping under load. Due to the physical characteristics of each individual conveyor, the time interval required to stop each conveyor under load varies. This would cause a pile up of material in the junction chutes between the conveyors, if they were all stopped simultaneously. These chutes have adequate capacity to take care of these pile-ups and they will occur under emergency stopping. They are not desirable, however, during normal operation. To avoid them, a so-called "Multiflex Timer" has been added to the control panel, through which the operator may stop the four slope conveyors in sequence with the proper time delay between each conveyor, beginning with the tunnel belt on Conveyor No. 1.

Even though the system of multiple units described is not old and possibly many more systems of similar design will be installed in the near future, the trend today is to simplicity. "Who knows but what a design for decline conveyors will be developed soon," said Mr. Jackson, "where one unit conveyor will be installed rather than four, or for even greater lengths and greater drops with greater tonnages, without the use of more expensive belting. With one conveyor all complicated interlocking control would be eliminated and, more important, all degradation at the many transfer points would be eliminated."

Additional equipment in the form of controls is advisable for all belt conveyors, including decline units. One such unit is a differential limit switch. This control is designed to detect slippage between the conveyor belt and the driving pulley. The reasons for using it are: first, to advise the operator that proper slack-side belt tensioning is not being applied for driving; second, to eliminate the hazard of a serious fire from heating of the pulley lagging and the belt; third, to prevent belt damage.



DEEPER DIGGING is facilitated by big dragline's durability, high output, and ability to dump spoil far from digging point. Cost of moving each cubic yard has been reduced.

Cost of Big Draglines Justified by Advantages Obtained

Reduction in cost of moving a cubic yard of stripping is the major factor in selection.

MINING COMPANIES, finding it increasingly necessary to uncover deep-lying minerals in open cuts, have demanded a mining dragline which would have useful life equal in hard service to that of a mining shovel. From this need of a large-capacity, heavy-duty, long-boom dragline grew the 1500-ton machine of today.

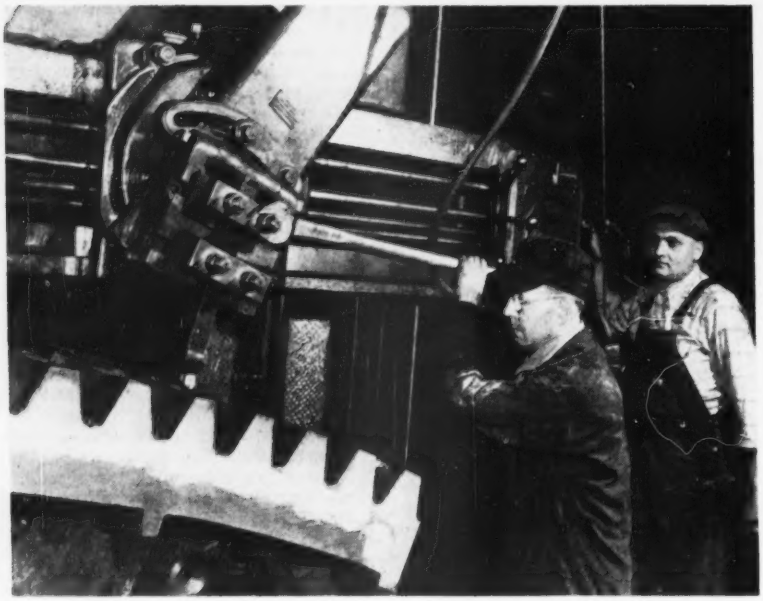
Dig, Swing and Walk Electrically

One of the largest machines that is able to move over land under its own power, this walking dragline travels on two 44-ton shoes, each 9x54 ft. in size. It takes 7-ft. 4-in. steps at a speed of about a tenth of a mile per hour.

In operation, the big walker digs with either a 30-cu. yd. bucket from a 200-ft. boom, or a 23-cu. yd. bucket from a 235-ft. boom. It can dig from a pit 120-ft. below the level it stands on, swing around and dump its 45-ton load on top of an eight-story building a city block from the digging point—all in less than 60 seconds. Overall, the dragline is 240 ft. long, 70 ft. wide and about 120 ft. high to the boom point.

More than 20 machines of this size have been built since 1944. Durability, high output and ability to dump material far from the digging point, and thus facilitate deeper digging make them valuable in mining. These quali-

Condensed from a paper by P. H. Woods, Bucyrus-Erie Co., presented at annual meeting of American Society of Mechanical Engineers New York, Dec. 1, 1952.



CUTTING TEETH for swing gear calls for special method, because no existing machine can cut teeth with 5-in. circular pitch on 24-ft. pitch diameter. Gear segments here are set up on 6-ft. openside planer.

THIRTY-YARD BUCKET must be of minimum weight with desired strength. Every pound which can be safely eliminated from its structure represents an added pound which can be dug.

ties add up to ability to move dirt and rock at lower unit cost.

The foremost reason why the big strippers do not handle (customarily) the material being mined is the lack of hauling equipment that is large and durable enough to receive a 45 ton load in one dump of the bucket. Under suitable conditions, one of these machines has dug 1-million cu. yd. of overburden a month, working three shifts a day.

Power is usually supplied at 4000 volts ac. It is taken to the drag through a 3-in. three-conductor flexible cable. Two 425-hp. hoist motors, two 425-hp. drag motors, four 137.5-hp. swing motors, and two 100-hp. walking motors are supplied with dc current by two m-g sets, one driven by a 1250-hp. synchronous motor and the other by a 600-hp. induction motor. Loads are intermittent and advantage can be taken of motor overload capacities to get momentary peaks beyond name-plate ratings.

The big strippers are standard units produced on a regular schedule, save for relatively minor options, such as air filters for the dragline's 67x35-ft. two-story house, or a different boom and bucket combination.

How long does it take to manufacture one of these draglines? This is difficult to answer because of the ever-changing supply situation, especially where electrical motors and equipment are concerned. Under ideal conditions a machine can be shipped in a minimum of eight months after the order has been placed.

Special Tooling

Even the large tools in Bucyrus-Erie's shops are too small in capacity to hande some of the components of the dragline, so these must be machined in special ways. Although the rate of production based on demand does not justify special tooling, the non-existence of sufficiently large standard tools has made it necessary to design and fabricate in these shops tooling that is unusual in the industry in respect to size.

A shallow metal "tub" 50 ft. in diameter and 3 ft. high with a soil-bearing area of slightly less than 2,000 sq. ft. is the dragline's base. Unit ground pressure of only 10 psi gives the big dragline its ability to work in relatively soft ground.

The 200-ton base, 50 ft. in diameter, as well as other components, must be made in sections small enough to ship by rail. This base is completely welded of plates and bars around the center casting. For rail shipment, it is arranged in 11 base sections, each 6 to 10 ft. wide by 25 to 35 ft. long. These sections must be carefully fitted and assembled in the shop, then taken apart and shipped individually to the field for assembly and finish welding of the base.

The 116 double-flanged rollers which support the upper structure travel on heavy rails bolted and welded to the base in the field. Similar rails are fastened to the underside of the sub-revolving frame to bear on the rollers. Rollers are conical and rails bevelled to give true rolling action.

10-Ton Facing Fixture Is Built

The 7-in. wide rails are made in eight sections, each an alloy-steel heat-treated casting. The problem of machining the arc of a 34-ft. circle was solved by using a 10-ton facing fixture which is applied to a 6-ft. openside planer.

The fixture is pivoted from an anchored stand, driven by a pin and slide arrangement bolted to the planer table. The curved ways under each edge of fixture are for steadying only.

The swing gear is also made of eight sections which bolt together to form a gear with 24-ft. pitch diameter. No existing gear machine can cut teeth with 5-in. circular pitch on a 24-ft. diameter, so a special method had to be devised. The gear segments

are set up on a 6-ft. openside planer. The machinist works to a table of angles which tells him how to set planer heads for machining near and far sides of each tooth. Four segments are bolted together and teeth cut at one time. The four pinions which mate with this gear have 10 teeth on a 22-in. pitch diameter. Pinion teeth are milled with special tools and fixtures on a conventional gear cutter.

The bare 29½x62-ft. revolving frame weighs 265 tons and is made in two major assemblies, one mounted on the other. These two sections must fit together closely for effective weight transfer without distortion. Fitup is accomplished through careful control of welding, and mating surfaces are not machined. The upper 50-in. deep 105-ton machinery frame and the 8-ft. deep 160-ton sub-structure are made up of large box girders temporarily assembled and fitted in the shop, then disassembled and shipped for field erection.

Since large operating machinery units with their wide-faced gears require very close alignment, preparing the machinery mounting pads on the upper machinery frame becomes a problem. The frame is temporarily assembled, checked and marked with the use of a surveyor's level and then disassembled. The individual sections are surfaced as required on an 11-ft. planer.

Tools Moved to Work

After reassembly of the planed sections, and before any installation of machinery, pads are again surveyed to be sure mounting surfaces are in a perfect plane. Machinery is then placed and lined up temporarily, mounting holes are marked, and machinery is again removed. Mounting holes are drilled by a universal drill press which is set on the machinery frame by an overhead crane. Reversing the customary procedure, the tools must be moved to the job, due to the size of the work.

The sub-revolving frame is shop-assembled upside down, allowing use of a tram to scribe pads for mounting of rails matching those applied to the base. After having been scribed, the pads are removed and finished on a planer. Sections of the sub-revolving frame are fastened together prior to field-welding with over 1600 1-in. finished bolts in reamed holes.

The walking cams are carried at the ends of 22-in. diameter, alloy-steel, forged shafts. Cam shafts are driven through four reductions by two motors in the sub-structure. Bearing surfaces are turned and honed to a super-finish with a special fixture on a 6-ft. lathe.

Ends of the walking shaft are squared by milling and planing and the cams shrunk on. Cams are kept at 300 deg. F. overnight in an electric furnace, then shafts are set in by overhead crane and the assembly allowed to cool.

The boom is a welded structure composed of T-shaped chords. Lacing is of tubular members, split at the ends and welded to chords and gusset plates. Tube lacing is welded airtight to keep water out. A surveyor's transit is used to check alignment of boom and boom foot connections.

Weight considerations are important. The 30-cu. yd. bucket is a product of much design and field testing to develop desired strength with minimum weight. Every pound which can be safely eliminated from the bucket structure represents an added pound which can be dug with each bite.

Need Train to Ship

The size of the dragline will permit neither complete assembly in the shop, nor shipping as a unit. Complete assembly and much welding and checking must be done on location. Under favorable conditions, about 35 men work three months to erect a walker in the field.

Just to ship one machine requires a trainload of more than 60 cars of the flat and gondola types to carry subassemblies and parts, all of which have been broken down to railroad clearance dimensions and carefully marked to guide erectors. In addition, three carloads of erecting equipment must be supplied.

In an early stage of erection the base is assembled and welded, and the large swing gear placed and leveled. Next the rail base must be planed. The field crews use a 10-ton portable facing machine, designed and built by the company. This is important because the upper works of the drag are supported by the rail-roller assembly. Since over 1000 man-hours of field welding go into the base structure, field machining is required after welding to be sure of a level base for the rails.

In Summary

Today's 30-cu. yd. dragline is designed and operated as one machine. But because of size problems it is arranged in units, several of which go into each major component. After these components are temporarily assembled and checked in the plant, these are dismantled for rail shipment in such ways as to permit accurate assembly welding and some finish machining on location at an open-pit mine.

Even though special machine tools and special methods must be employed, the cost is justified in the mining industry's thinking. The large drag can uncover deeper-lying minerals, can cast the overburden farther than ever before. Most important, the cost of moving each yard has been reduced significantly.

Heaters for Truck Engines

FOR STARTING DIESEL-DRIVEN EQUIPMENT in cold weather on the Mesabi, one large operator helps the engine by spraying a mixture of equal parts of ether and fuel oil into the intake manifold. This is said to work well, but must be controlled.

In general, this company does not use heaters on the engines of trucks and tractors. One of its mines is equipped with a parking-lot heater setup, but mechanical troubles have been a problem. If this unit could be made foolproof and simple, it is thought, the problem of outdoor storage could be licked.

On their diesel shovels the same operator uses a coal-burning stove to heat the jacket water.

Another company having a truck fleet of considerable size ordinarily uses no heaters. However, the shop storage facilities at some isolated open pits of this operator are inadequate to house all the trucks during a shutdown so they have equipped the engines with KIM-Hotstart heaters and keep the power on these while the trucks are down.

This necessitates having a watchman to make sure that the heaters are working properly, lest an engine freeze up because of lack of power, poor connection or inoperative heater. Ordinarily when the mine is operating on a basis of 20 shifts per week, the trucks which cannot be put into warm storage for the one non-working shift are drained.

Bethlehem's New Grace Mine *(Continued from p. 90)*

from a special track-mounted, batch hopper car which operates between the concrete plant and the shaft.

In the new mill, magnetic separation will be used to produce a concentrate running about 65% iron. Ratio of concentration[4] is expected to be approximately 1.5 to 1. Present plans call for the production of about 6000 tons of concentrate daily which means that mill feed would approximate 9000 tons daily. Magnetite concentrates will be agglomerated to produce suitable blast-furnace feed.

Bethlehem's management, as a matter of policy, regards beauty of the community as an asset, and even at this early stage of construction it is quite evident that the surface plant architecture at the Grace mine will blend harmoniously with the rolling tree-covered countryside.

[4]The above determinations are based on the Reading Railroad Magazine report which stated that grade of ore is 44%, grade of concentrates 65%, and tonnage of concentrates would be 5,800 tons per day.

$\frac{65}{44}$ = 1.48 tons of ore to produce 1 ton of concentrate.

5,800 X 1.48 = 8,584 tons of ore treated per day.

 (Continued from page 69)

Tungsten Ore Supply Increasing

Total new supply of tungsten ore and concentrates in the third quarter was substantially higher than that of the second quarter and well in excess of actual consumption, statistics compiled by the Bureau of Mines indicate. Stockpiling probably absorbed the surplus. Latest statistics, in short tons of 60% WO_3, are summarized as follows:

Year	U. S. Mine Production	Imports for Consumption	U. S. Consumption	Stocks at End (a)
		Average Quarterly		
1948	1,060	1,983	2,326	6,145
1949	761	1,643	1,303	5,313
1950	1,041	4,242	1,733	5,608
1951	1,554	1,675	2,997	4,488
1952:		Quarterly		
1st quarter	1,585	(b) 3,668	2,708	3,257
2d quarter	1,812	3,947	2,126	2,596
3d quarter	1,758	5,089	2,089	2,006

(a) Includes ore and concentrates in the hands of consumers, dealers, and domestic producers. On Sept. 30, 1952, consumers and dealers had 1,688 tons on hand, and domestic producers 318 tons. (b) Revised.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Materials. Delivered prices in effect as December ended were as follows:

	Per Long Ton £ s. d.
COPPER:	
Electrolytic, high conductivity	285 0 0
Fire refined, high conductivity	285 0 0
Fire refined, high grade	284 10 0
Fire refined, min. 99.7 percent	284 0 0
Fire refined, min. 99.2 percent	283 10 0
ZINC:	
Foreign (G.o.b.) duty paid	110 0 0
Domestic (G.o.b.) duty paid	110 0 0
Prime Western and debased	110 0 0
Refined and electrolytic	114 0 0
Minimum 99.99 percent	116 0 0

Lead: Fixed quotations by the British Ministry of Materials were discontinued Oct. 1, 1952.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

December 31, 1952

Aluminum ingot, 99 plus percent, lb. (effective Aug. 4)	20c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	37.97c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.75 @ $2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb	$2.40
Germanium, lb.	$340.00
Indium, troy oz	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz	$24.00
Platinum (Official quotation wholesale lots) troy oz	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$218 @ $220
Selenium, 99.5 percent, lb	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$45.00 @ $48.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $30.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$9.45
Mesabi bessemer	$9.20
Mesabi, non-bessemer	$9.05
Lead (Galena), 80 percent, Joplin, Mo., ton	$180.90
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.20 @ $1.22 c.i.f. U.S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, f.o.b. foreign ports	$51.50 @ $52.50
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$84.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.05
Germanium Oxide, lb.	$142.00

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$225
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	11.4c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF_2	$40.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth., f.o.b. Georgia or Flordia, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$54.50
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb	$3.85

PROSPERITY in the USA: Who Has It?

How prosperous *are* the people of the United States?

The previous editorial in this series answered this question for the average American. His prosperity has increased only slightly in recent years.

But the average tells only a part, and in many ways not the most important part of the story. Which individuals and groups have prospered more, which less? (The average, the result of a statistical calculation rather than a creation of flesh and blood, tells nothing about that.)

The purpose of this message is solely to get at the facts on this question of how prosperity is distributed. This is not easy. In spite of the crucial importance of the subject, the available information is limited. Even so it is possible to provide a rough answer to the question, "Who has the prosperity?"

We Have Had a Revolution

The distribution of income in the United States has changed so greatly in the past twenty years that Arthur F. Burns, Research Director of the National Bureau of Economic Research, world renowned for its impartiality and technical competence, calls it "one of the great social revolutions of history." A part of this revolution is portrayed by the following table which shows that individual incomes are both much larger and much more evenly distributed than they were twenty years ago. Clearly, a large new middle-class has been created.

DISTRIBUTION OF REAL INCOME

Dollars of Income*	Per Cent of Families in Each Income Group	
	1929	*1951*
Under 1,000	17%	13%
1,000 – 2,000	24	15
2,000 – 3,000	24	18
3,000 – 4,000	14	18
4,000 – 5,000	6	15
5,000 – 7,500	9	14
7,500 and over	6	7
	100%	100%

*Adjusted for price changes to give the dollar its 1951 purchasing power.

Some light on why this income revolution has taken place can be found by tracing incomes to their source. Since 1929, for instance, employees have clearly made the biggest gains in total income. This can be seen in the next table. People who own their own businesses have done second best. Farmers, who are often thought to be doing handsomely indeed, have been outstripped in the income race by employees and businessmen. People whose incomes depend upon pensions, insurance policies, and other relatively fixed returns such as rent, interest and dividends have lagged far behind.

HOW REAL INCOME HAS CHANGED*

Types of Income	Percentage Change 1929 to 1951
Wages & salaries of employees.	+123%
Income of professional men & unincorporated business	+108
Farm operators' income	+56
Rental income	+1
Dividends	+2
Interest	−35

*In this and the previous table account is taken of changes in the cost of living. But adjustment for the changing tax load was not possible, as it is in the computations which follow.

The Biggest Gains

Employees have made the biggest gains in income, but the term "employees" covers a wide assortment of people—from the presidents of the biggest corporations to factory sweepers. How have different groups of employees prospered? Some indication is provided by results of a survey of salaries in 41 corporations made by Arch Patton of McKinsey and Company and recently summarized in the *Harvard Business Review*. This survey showed that between 1939 and 1950, after adjustment both for higher living costs and for higher taxes, factory and office employees made modest gains in income while management personnel suffered losses ranging from 40% to 60%.

While factory and office workers generally have made greater income gains than others, their gains have varied greatly from industry to industry. During the past five years, for example, steel workers' take-home pay (adjusted for both taxes and price changes) has increased by 22%, that of textile workers 9%, employees of general merchandise stores 4%, and that of laundry workers not at all.

What About Organization?

How have organized workers fared compared to unorganized workers? There is no round-up of facts that makes possible a direct comparison between the two. Such evidence as there is shows it is indeed an open question whether union members have done any better than others. Steel workers, for instance, who are strongly unionized are among the highly paid manufacturing workers. Farm workers are generally not unionized, and they work in one of the most competitive industries in America.

But farm workers have made income gains which far surpass those of steel workers. Real wages of farm workers increased 2½ times more than those in the steel industry between 1939 and 1952. This fact may prove nothing more than that, in a period of inflation and manpower shortage, the less skilled workers whose incomes are ordinarily low make the biggest percentage gain in income. Further support for this conclusion is found in the construction industry where real wages of unskilled labor increased 37% between 1939 and 1952, while those of skilled labor increased only 4%.

Why Most Incomes Are Higher

Prosperity, who has it? We may conclude that workers have been getting much more of it lately than managers or property owners, that unskilled wage and salary earners have made the largest gains, and that income generally is much more evenly distributed.

Where has the money come from to raise low bracket incomes? It has come partly from an increase in the total national income, but partly also from cutting down the share received by people in the highest income brackets. While the top 5% received 33.5% of the income after taxes in 1929, their share of income has now been cut about in half. For every $11 of increase in income to the lower 95% of income receivers, about $7 has come from increased production, and about $4 by taking that amount from the top 5%.

Top bracket incomes have now been cut so deeply that the possibilities of increasing the income of the rest of the people by "soaking the rich" have largely disappeared. Indeed, if all of the income after taxes of everyone earning over $25,000 in 1951 was taken away and redistributed among the remaining Americans, each person would receive only about $65.

The significance of this revolution in income distribution is clear. It is that there is only one way by which the great mass of us Americans can continue to increase our individual prosperity. This is by earning the increase through more and more efficient production. In plotting the economic course of the U.S.A. this fact is of decisive consequence.

McGraw-Hill Publishing Company, Inc.

DORRCO DOINGS IN 1952

The outstanding event in '52 has been the landslide election of General Eisenhower, with Congress Republican by a very small plurality. A year ago I stated "Millions of us here today are thrilled by the hope that we can vote for a really great man, one like our first President, a great General, but above all an able and very wise patriot. No one believes that he would leave his present duties unless he felt that as President he could better serve his country and the world. It is inspiring to realize that he certainly can count on our strongest leaders to help build his team." Now 33 million voters, who gave him the greatest job in the world, must be ready to work as unselfishly for our country and the world as we expect him to do. America has taken heart at the promise of leadership based on unquestioned integrity of mind and character—and I feel all parts of the free world will do likewise.

* * *

RESEARCH AND DEVELOPMENT — We are continuing fundamental studies on classification and sedimentation as well as exploring further applications for fluidizing techniques. The Hydroscillator, first introduced at Tennessee Copper, is extending into other fields, notably low grade iron ore where the trend is towards sharper separations and cleaner sands. Several interesting developments in sewage treatment are currently under investigation. These include an improved digestion process and a method of accelerating secondary treatment.

KRAFT MILL RECAUSTICIZING — We recently conducted a survey in this field, visiting thirty pulp and paper mills, all of which employ the Dorr Continuous Recausticizing System. The main purpose of our visits was to discuss operational trends and to seek ideas for improvement. The general response was gratifyingly favorable and several changes have been adopted which will result in further increasing the efficiency of the Dorr System.

CONSULTING ENGINEERING — Our major design project for the year has been a large triple superphosphate plant for one of America's leading fertilizer producers. Other projects handled this year included such diversified operations as cyanide plants in the Middle East and Africa, a new zinc concentrator in the U. S., further developments in the chemical fertilizer field, and various hydro-metallurgical problems.

ABROAD — All our Associates in Europe and our recently formed Company in India have completed a very satisfactory year. Among our projects starting this year were a phosphoric acid plant in Greece and a kraft pulp mill in Austria. For the latter we supplied a Continuous Recausticizing System as well as a battery of Oliver Filters for the first continuous brown stock washing plant in Europe.

FLUOSOLIDS — The first commercial FluoSolids installation for roasting zinc concentrate went into operation last summer. It is producing SO_2 gas for sulfuric acid manufacture and a desulfurized zinc calcine for leaching prior to electrolytic zinc production. In addition to this installation, eight FluoSolids Reactors at paper mills in the U. S., Canada and Norway are either in operation or under construction to supply major portions of their SO_2 requirements for sulphite cooking liquor.

MUNICIPAL SANITATION — 1952 has been another active year for us in the fields of municipal water and sewage treatment. A very noticeable trend has been the mechanization of treatment plants serving smaller towns and municipalities. Here our complete small-scale plants are providing a high degree of sewage treatment for populations under 5,000.

INDUSTRIAL WATER TREATMENT — Accelerated by the demand for greater product quality control, industrial water treatment is rapidly approaching the municipal field both in size of installations and completeness of treatment. In the first ten months of 1952 we received orders for Dorr water pretreatment equipment which in the aggregate will handle almost 80 million gallons daily. These installations varied from a 600 gallon per hour ion-exchange system for a pharmaceutical manufacturer to a 26 MGD Dorrco Hydro-Treator for a new dissolving pulp mill.

MINE BACKFILL — The compact, highly efficient DorrClone is becoming increasingly popular for mine backfilling operations. One installation at Madsen Red Lake Gold Mines employs two stages to produce 120 tons per day of fill with a percolation rate of 4-6 in/hr. Key to the two-stage DorrClone flowsheet is flexibility. Any type of fill can be produced from practically any composition of mill tailings.

CANE SUGAR — In 1920, United Sugar Companies' Ingenio Los Mochis, one of Mexico's leading sugar producers, put into operation the first Dorr Continuous Cane Juice Clarifier to be ordered, following the initial demonstration at the Cuban American Sugar Company's Central Mercedita. In subsequent years, additional Dorr units were installed as the mill was expanded. In 1952 another Dorr Multifeed was ordered as part of Ingenio Los Mochis' current expansion program, and will go into operation for the 1953 crop. This is typical of the industry's continuing confidence in our sugar equipment.

* * *

We started the year in Cuba and enroute home saw an industrial revolution in Miami, engineered by MRA, whose principles we have seen working so effectively for industrial and international peace and understanding in many parts of the world today.

Crossing to Europe in May, we spent nearly a month in Spain. The incident of a Spanish Engineer working at Westport 26 years ago resulted in intimate contact with the warmest Spanish hospitality, giving us the feeling that we were privileged to come closer than most visitors to the real Spain. We left, greatly impressed by Spanish progress and the general happy philosophy of the people.

In Europe, visits to the ACHEMA Exhibit in Frankfurt and the Society of Chemical Industry Meeting in Aberdeen were most worthwhile, and the close cooperation and fine work of our Associates abroad brought renewed stimulation and admiration.

We are closing one of the best years in our history, with a strong conviction that with better understanding as a whole we can look forward to a gradually improving world.

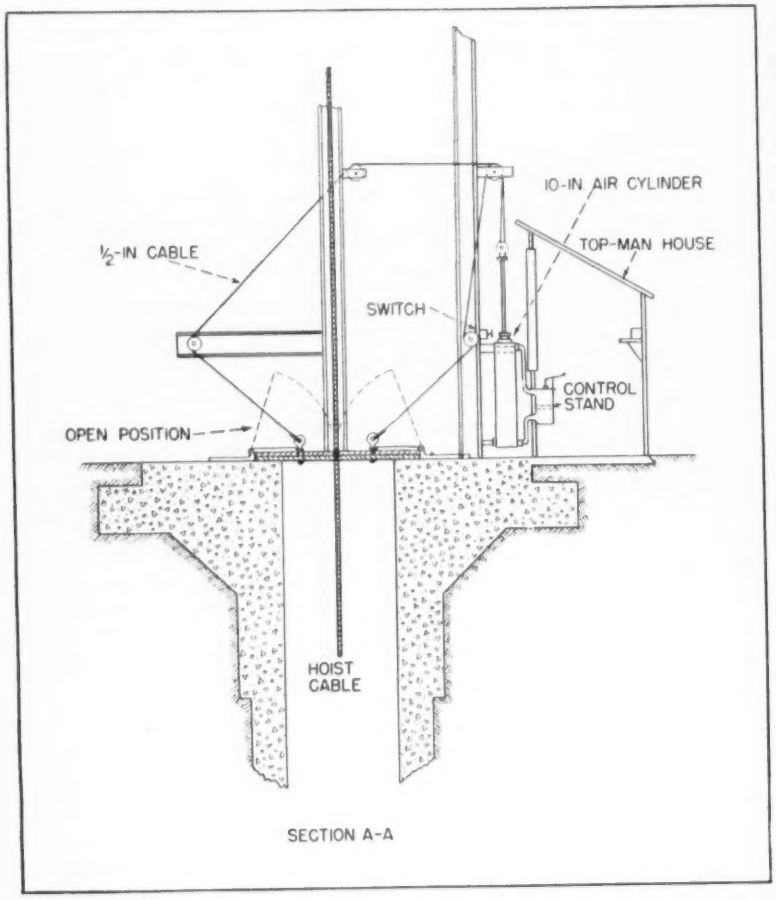
We all join in sending to our friends everywhere greetings and good wishes.

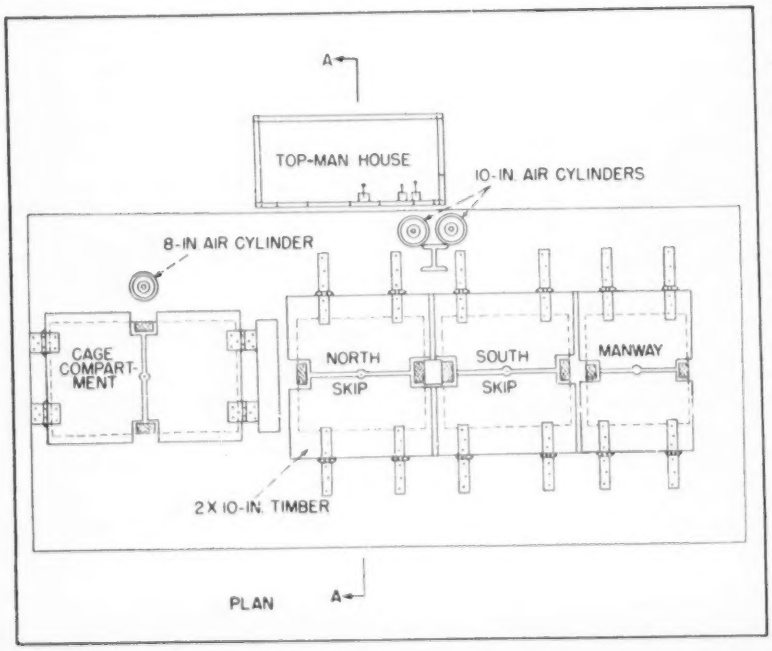
John V. Dorr

Barry Place, Stamford, Conn.

DORRCO

OPERATING IDEAS





Air-Operated Doors Protect Shaft Crews

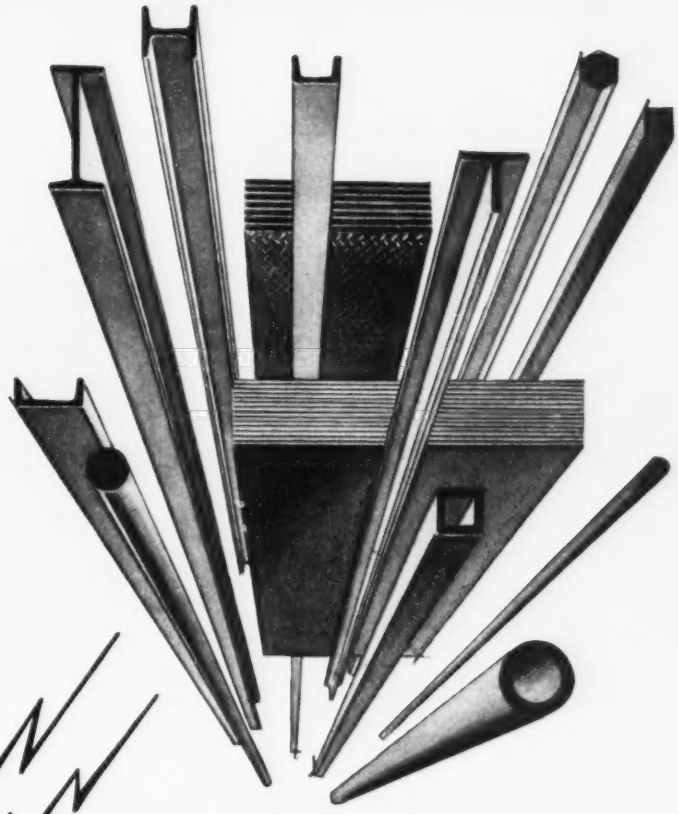
THIS AIR-OPERATED SAFETY DOOR was devised and is used by Foley Bros., Inc., to cover compartments of the Deep Ruth shaft which the company is sinking under contract for Kennecott Copper Corp., Nevada Mines Division, near Ruth, Nevada. It prevents foreign matter from falling into the shaft during sinking.

Doors covering the skip compartments are operated by a cable system attached to two air cylinders 10 in. in diameter and a 42-in. stroke. All are hinged 16 in. back from the sides of the shaft to keep them in a slightly inclined position when fully open, thus making gravity closure possible when the ½-in. cables are slacked off.

The air cylinders are operated by means of four-way valves installed in the top-man house at the center of the shaft on the east side. Large windows permit good vision of all compartments. This building also contains a speaker system master box to allow the top-man to converse with the hoistman, the men working at the bottom of the shaft, and operators in charge of the pumping plant 350 ft. below the collar of the shaft. All bell signals for moving the bucket crosshead at the collar of the shaft are given by the top-man from within the building. As a consequence, the top-man is fully apprised at all times as to what is going on underground and has control of hoisting operations.

The switch installed at the top of the air cylinders is an additional safeguard against the hoistman bringing a cage through the compartments with doors closed. It is actuated by the small round disk on the piston on the downward stroke, and turns on a light in the hoist house when the doors are fully open. The setup used on the cage compartment is identical to that used on the skip compartments, with the air cylinder on the cable system being 8 in. in diameter. Doors covering the manway compartment are operated manually. Roy Hickman, job manager, Foley Bros., Inc., is in charge of sinking operations at the Ruth shaft.

STEEL
for the MINING INDUSTRY



In stock...Prompt shipment

When you call Ryerson for steel, you can be sure of prompt, personal service from the minute your call comes in. With the exception of those few items remaining in short supply, we can fill all your orders quickly from stock on hand. And to assist you on any problem of steel procurement, application or fabrication, the friendly counsel of experienced Ryerson specialists is always yours for the asking.

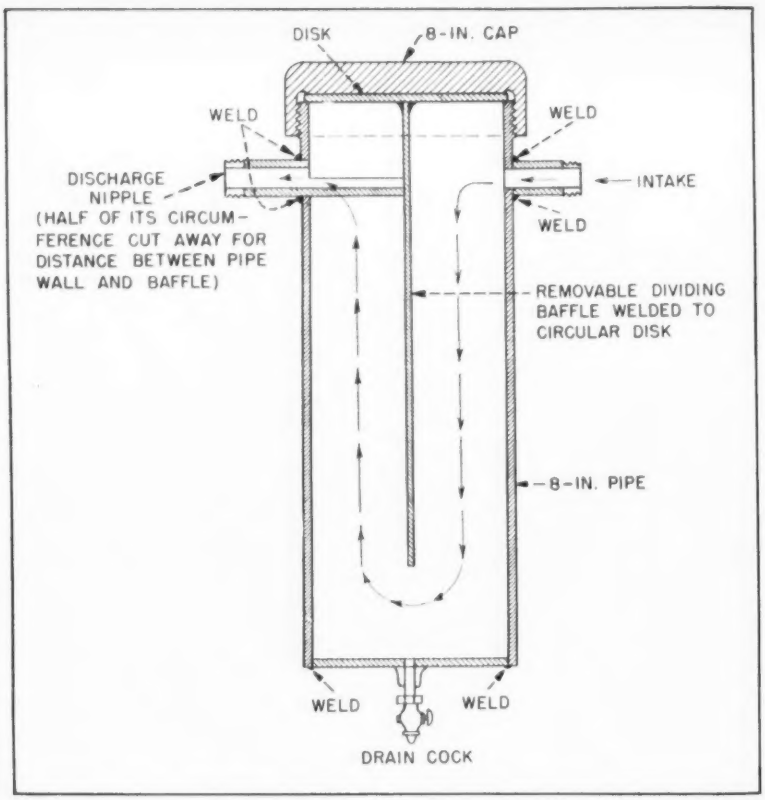
PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

CALL RYERSON

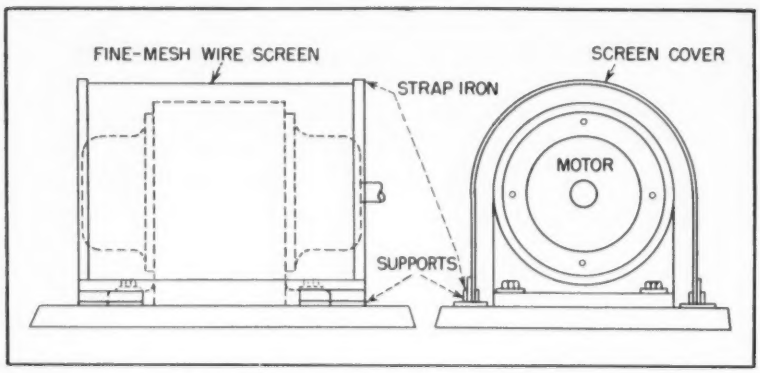
JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SEATTLE • SPOKANE

Separator Removes Air Line Water



THIS MECHANICAL SEPARATOR has proved to be effective in removing water and oil from air lines serving an underground drill sharpening and repair shop at a western lead-zinc mine. It is made from scrap material at low cost, and consists of a receiving chamber about 26 in. long made from 8-in. pipe, a top cover in the form of a standard pipe cap, a removable steel baffle, intake and discharge arrangements welded on, and a drain cock. The baffle is welded to a circular disk resting on top of the receiving chamber and held in place by the pipe cap, and the outlet nipple extending into the receiving chamber has half of its circumference cut away for the distance between the pipe wall and baffle. The separator worked best when installed in the discharge air line near the compressor. Incoming air must make four 90-deg. turns before leaving the separator, and in the course of this travel, moisture is cast against the baffle and other steel surfaces.

Screen Cools Motor



MOTORS DRIVING KILNS, roasters, and other units at smelters are exposed to high-temperature radiant heat, and as a consequence operate at above-normal temperatures. Protection against radiant heat can be given by intercepting it with a screen installed as a shield between the motor and kiln or furnace as shown here. A cover made of fine mesh wire mounted over the motor has been found effective at several plants.

Cost-Cutting Maintenance Ideas From St. Joseph Lead Co.

B. F. MURPHY, general manager of St. Joseph Lead Co. operations in southeastern Missouri, mentions the following ideas which have proved valuable:

1. Older mine cars in the district are built from structural steel, riveted together with 425 $\frac{3}{4}$-in. rivets. Formerly any part of these cars that had to be replaced, due to wear or damage, was riveted back. Subsequently, however, the company has switched over to electric welding, effecting a saving of 27% in labor and material required for mine car maintenance.

2. In the crushing plant, the practice was to hard-surface crusher rolls by electric welding. One man would put on about 25 lb. of rods in an eight-hour shift, using a $\frac{1}{4}$-in. dia. rod. By rigging up for a slow drive in a pair of bearings, and mounting an automatic welding head on a carriage, now up to 90 lb. of rod is added to the roll head. A smoother and more uniform distribution of metal is affected with the automatic welding head.

3. In the disposition of our chat or tailings from the mills, pumps are used. Impeller and casing are made of chrome-nickel iron with a hardness ranging from 400 to 450 Brinell. These parts were formerly machined by grinding. Subsequently, it has been found that by using a carbide tool running at cutting speeds of 70 to 75 fpm, the machining of these pump parts can be done very nicely. Saving of time of machining with hard carbide tools over grinding is about 50%.

MOVING A MOUNTAIN OF IRON

JUST before winter locks the Great Lakes, mountains of iron ore hit the docks for shipment and must be stockpiled in a hurry. To handle this rough, rush job for the Pittsburgh Dock Co., A. J. Baltes, Inc., of Norwalk, Ohio, uses a Caterpillar Diesel DW20 Tractor and No. 20 Scraper, push-loaded with a D8 track-type Tractor.

"I like the long-life performance of Caterpillar equipment," foreman K. H. Myers says. His earthmovers are on the go 10 hours a day handling this iron ore, hauling 24-ton loads a half mile, 7 or 8 trips an hour. "And I like their economy, too," he adds, for his DW20 wheel-type Tractor needs only about 45 gallons of fuel a day, *one-half* the consumption of another manufacturer's unit on the same job.

There's extra power and capacity built into the Caterpillar DW20 Tractor and No. 20 Scraper team. The 225-HP Diesel engine in the tractor is precisely balanced with the 20-cu.-yd. heaped capacity of the scraper to give sustained, long-haul, high-speed, low-cost service. The scraper, with a flat, double-bottomed bowl, is cable-operated for fast, sure loading and spreading. And this is a *safe* rig, too: anti-jackknife devices, large air-actuated brakes and power steering give operators complete control and cut down-time due to damaged equipment.

Your Caterpillar Dealer will be glad to demonstrate. And remember, only genuine Cat parts can give you the genuine Caterpillar quality that's built into every one of these big yellow machines.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Basic Problems as to Metal Mining Industry Await President Eisenhower and 83rd Congress

TRUMAN'S MOBILIZATION officials recommended to the new administration that the Defense Production Act be kept on the books for another year. This would continue the President's authority to allocate strategic materials and to expand supplies of the more critical metals by such devices as long-term market guarantees, subsidized exploration, loans and rapid tax amortization.

But the officials responsible for minerals expansion disagreed with the Economic Stabilization Agency's recommendation that price control authority be retained, too. They said price control should be scrapped because of its adverse effect on the minerals expansion program.

The defense agencies have $600-million on their books until June 30 for additional long-term materials procurement contracts. On the basis of estimated ultimate net cost, they have already committed about $6-billion in such deals. The commitments were made on $2.1-billion authority. If the mobilization program is maintained near current levels and business in general stays good, there'll be no problem in this respect. But if the bottom should drop out of the metal markets, the new administration will have inherited a difficult problem.

DMPA has mapped out expansion programs for 42 materials, of which 22 have been completed. Eight programs are 90-99% completed, four are 80-89%, one is 70-79%, and seven are less than 70% finished. Cobalt, nickel, tantalum, columbium, industrial diamonds, beryllium, and titanium are presumably in the last category.

If Congress fails to follow Truman's recommendations or if the materials goals are not pushed up, DMPA will have worked itself out of business by June 30. The job of administering the long-term procurement contracts will then be assumed by GSA, a permanent government agency.

The new administration and Congress will also have to resolve the question of whether the United States should become more dependent on low-cost, foreign, sources of supply—the Paley Commission's philosophy—or should foster a higher level of domestic mining that can be expanded in case of all-out war.

Congressional hearings on mobilization legislation are already scheduled for next month. The hearings will provide a significant vehicle for thrashing things out and for bringing order out of the chaos in Washington's strategic materials policy.

Mining Mess in Washington

That chaos does exist is sadly evident. It becomes increasingly obvious when departing officials in the mobilization agencies—both industry men and civil service careerists—begin to air their gripes in public.

The consensus is that only because of frequent stretch-outs in the military build-up program have we been spared dangerous shortages of strategic materials. If original schedules had been maintained, the shenanigans in minerals expansion policy would have caused a major pinch on U. S. industry.

One top official has expressed the problem very succinctly: When supply shortages become critical, the government must stimulate more production and reduce consumption. The former is DMPA's function, the latter NPA's.

But neither agency has been permitted to tackle its problem very freely. There have been too many other agencies in the picture.

This critic estimates that he and other top-ranking minerals planners have spent 95% of their time negotiating among themselves rather than with metals producers and consumers. ODM, DPA, NPA, DMPA, OPS, MSA, State Department and Interior Department officials have all gotten into the act, some agencies wanting to solve particular problems with another agency's authority. Copper has been the classic case of this type.

There are other complaints that are more subtle. Friction between officials on leave from private industry and career government men developed. Too frequently, frustrated industry people now declare, important policy decisions have been made without benefit of their technical consultation. Government men with little knowledge of a specialized industry have had the final say on what to do about the various materials shortages. The critics point to ferrous alloys and copper as perfect examples.

Then there's the gripe of high-level administration officials who complain of President Eisenhower's failure to assign liaison men to the mobilization agencies soon after his election. Without knowing whether they would be around later on, and without knowledge of the new administration's policy on material allocations and related controls, they have been required to make important decisions according to this complaint. The point is that effects of these decisions will not be felt until months later.

As far as the mining industry is concerned, it is understating the situation to say that Eisenhower will have a mess to straighten out in Washington.

Mining Committee Chairman

Rep. John P. Saylor, a Johnstown, Pa., lawyer, will be chairman of the House Subcommittee on Mines and Mining in the 83rd Congress. Rep. Wesley A. D'Ewart (Mont.) who was listed in this column last month as the new chairman, has decided to assume the chairmanship of the House Subcommittee on Public Lands instead. Both are subcommittees of the House Committee on Interior and Insular Affairs. Rep Saylor was first elected to Congress in 1949.

U. N. and Mining

One of the United Nations' most valuable but least publicized activities is its Technical Assistance Program, administered by the Economic and Social Council. The program's purpose is similar to that of the U. S. State Department's Point Four program (*E&MJ*, July 1952, p. 111): To provide technical aid to under-developed countries. Its methods: Assigning technical experts to specific projects in member nations and awarding fellowships and scholarships. During fiscal 1952, the program's costs totalled $9.4-million.

As in Point Four, mining on an overall basis is a relatively minor field. But the mining projects that have been started are significantly interesting.

An expert was assigned to advise the Bolivian Government on mineral production, mining cost analysis, and smelting for six months. Scholarships were awarded Brazilians for study on utilization of mineral resources and metallurgical techniques. Experts were sent to Israel to advise on general metallurgical problems and on the exploitation of peat deposits.

Jordan received an electrochemical engineer to advise on the extraction of bromide and magnesium from the Dead Sea by electrolysis. Libya received a mineralogist for six months, Turkey and El Salvador geologists. A fellowship was awarded a Pak-

Istani on silver-dredging operations, a Filipino on metallurgy, a Southern Rhodesian on mines mechanization, and a Venezuelan on a study of photogeology.

Larger projects have been set up in Ceylon and Yugoslavia. In the former country a mineralogist experienced in mining and refining kaolin will be assigned to plan a kaolin refining plant, while another expert will advise the government on the installation of a steel mill for electro-smelting of iron ore in a Tysland-Hold furnace. Already an expert is in Ceylon working on plans to exploit the country's mineral-rich sands. A plant capable of processing 100,000 tons of raw sand a year will be built to recover ilmenite and rutile for titanium and zircon for alloys and high temperature refractories.

In Yugoslavia, there are U. N. experts advising on base-metal mining methods, the production and processing of asbestos fibre, zinc processing, mining and dressing low-grade manganese ore, new methods of roasting mercury ore and extracting mercury, and mining and treating mica.

Paley Report

NSRB' study on Paley Commission recommendations has been passed on to the new administration. Headway is being made on one of the Paley Commission's fundamental and noncontroversial proposals: That an "intensive program of basic scientific research and technical development be undertaken on techniques and instruments of exploration for minerals."

The National Science Foundation, the two-year old government agency responsible for developing and coordinating national science policy on basic research, has set up an advisory panel on minerals research to work on the matter. Donald H. McLaughlin, president of Homestake Mining Co., San Francisco, and a member of the National Science Board, is chairman.

Among the other members: Alan Bateman, Yale economic geology professor; James Boyd, Kennecott Copper's exploration manager and former Bureau of Mines director; Arthur H. Bunker, president, Climax Molybdenum Co., and a Paley Commission member; L. C. Graton, Harvard mining geology professor; John Gustafson, M. A. Hanna Co., William E. Wrather, director, and Thomas Nolar, assistant director, U. S. Geological survey; Louis Slichter, director, University of California's Institute for Geophysics; John Vanderwilt, president, Colorado School of Mines.

At its first meeting, the panel said it will coordinate and stimulate more fundamental research in mineral exploration, probably with financial support. A smaller working committee will be set up to survey what's going on in the field now, and will present a report to the full panel in March.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

- Mine, Mill and Smelter Workers is controlled by Communists.
- Most Mine-Mill members are not Communists, should get rid of present leadership "forthwith."
- Congress should pass the McCarran bill (S. 2548) to prevent Communists from holding union office or representing workers and (2) permit employers to fire workers belonging to subversive organizations.
- The Attorney General should consider perjury charges against Mine-Mill officers who signed Taft-Hartley Non-Communist affidavits.

There, in a nutshell, you have the recommendations just released by the McCarran Internal Security Subcommittee which investigated Mine-Mill at Salt Lake City, Oct. 6-10 (E&MJ, Nov., 1952, p. 124).

The report of more than 300 pages, containing the full transcript of the four days of hearings at Salt Lake City, will be turned over to the Department of Justice.

In it, at least six top Mine-Mill leaders are identified as Communists in testimony by their former associates in the union and other former Communists. President John Clark and western vice president Orville Larson were exceptions. While not known as Communists, they were described as "collaborators" and "captives" of the Communists.

Here is a run-down of the evidence against the alleged Communists in Mine-Mill:

Maurice E. Travis, secretary-treasurer—resigned from Communist party to sign non-Communist affidavit; "undoubtedly the key figure in the entire union apparatus."

Nathan Witt, Mine-Mill counsel—"named by Whittaker Chambers as a member of the espionage cell of the Communists in the federal government."

Al Skinner, regional director at Salt Lake City and coordinator of Kennecott bargaining council—former instructor at Communist party training school in Chicago; attended Communist party meetings.

Graham (Cozy) Dolan, special aide to Mine-Mill officers attended Communist party meetings.

Herman Clott, Washington representative—"A dues-paying member of the Communist party."

Clinton E. Jencks, international representative—attended Communist party meetings.

Rod Holmgren, assistant editor of Mine-Mill newspaper, "The Union"—former instructor at Communist party training school in Chicago.

OTHER HARASSMENTS OF LEFT-WING LEADERS: The McCarran Subcommittee is not alone in going after Communists in the labor movement.

A court in Camden, N. J., has convicted one left-wing leader for signing a false affidavit, imposed a five-year jail sentence. NLRB decertified his union.

Department of Justice has moved to revoke the citizenship of James Matles, top organizer for the left-wing United Electrical Workers, on grounds of lying when he denied in his citizenship application being a member of the Communist party. U. S. Chamber's new "committee on communism" is investigating to find out if Communist agents are fomenting strikes in defense industries.

KENNECOTT SETTLES WITH MINE-MILL: Kennecott, last of the big four, came to terms with Mine-Mill for its divisions in Utah, Nevada and New Mexico. The package is about 9¢ an hour, including 7½¢ general increase, reclassifications and three weeks vacation after 15 years. Wage boost is retroactive to July 1. Contract runs only until June 30. Kennecott gave small cost-of-living increase year ago.

PERSONAL NEWS

Duncan Finlayson has retired from the International Nickel Company of Canada, Ltd., Copper Cliff, Ont. after 40 years. Starting as a motor operator on the charge floor in the blast furnace building in 1912, Mr. Finlayson retired as superintendent of smelters.

James J. Russell, New York, N. Y., president, chairman of the board, and chief executive officer of Revere Copper and Brass Inc., has been elected a member of the board of directors, American Smelting & Refining Co., New York, N. Y.

Charles F. Ayer, chairman of the board, Newmont Mining Co., and **G. R. Mrkvicka**, director and treasurer, Newmont Mining Corp., both of New York, N. Y., have retired as board members of Magma Arizona Railroad Co., supplier of the Magma mine at Superior, Ariz. Magma Copper Co. officials elected directors are **Roy Bonebrake**, secretary; **H. E. Dodge**, vice president and treasurer; **W. P. Goss**, vice president and general manager; **A. J. McNabb**, president; **E. W. Rice**, general counsel; **W. P. Schmid**, assistant treasurer; and **Frank Sarver**, purchasing agent.

John M. Bandel has been appointed vice president of Electro Metallurgical Co., New York, N. Y., a division of Union Carbide and Carbon Corp. Mr. Bandel has been for seven years assistant to **E. H. Mangan**, recently made executive vice president.

Clifford F. Hood has been elected president of the United States Steel Corp., New York, N. Y. He also becomes a member of the board of directors and a member of the finance committee, with **Benjamin F. Fairless** continuing as chairman of the board and chief executive officer. **Robert C. Tyson** has become vice chairman and member of the finance committee and member of the board. **Harvey B. Jordan** has become executive vice president, operations of the corporation.

Guy C. Riddell has been doing consulting work recently in Cartersville, Ga.

John G. Hall has been appointed assistant plant manager of National Lead Co.'s MacIntyre development in Tahawus, N. Y. Mr. Hall has been with Chief Consolidated Mining Co., Salt Lake City, Utah, as superintendent. **A. J. McDonel**, previously with Bunker Hill & Sullivan M&S Co., Kellogg, Idaho, has been named chief engineer at MacIntyre.

The Robert H. Richards award of the AIME will be presented to **E. W. Engelmann**, assistant general manager, Utah Copper Division, Kennecott Copper Corp. The award is being given to Mr. Engelmann "for his outstanding accomplishments in advancing the technique of the metallurgy and beneficiation of copper ores."

Floyd E. Albertson has left his position as mill superintendent for Cia. Minera de Oruro, Seccion Colquiri, Oruro to return to his home in Coeur d'Alene, Idaho.

Dr. Joseph F. Haseman, formerly research chemist with Tennessee Valley Authority, Wilson Dam, Alabama, has joined the research and development staff of Foote Mineral Co., Berwyn, Pa. Dr. Haseman will be group leader of the new minerals separation division.

SHELDON P. WIMPFEN, assistant director of the Division of Raw Materials, Atomic Energy Commission is manager of the Grand Junction Operations Office. The new office consolidates the AEC's uranium exploration and procurement programs on the Colorado Plateau. Frank MacPherson, manager of the Colorado Raw Materials Office, will be director of production. Ernest Gordon, chief of the Grand Junction Exploration Branch, will be director of exploration. George G. Gallagher, assistant director for domestic production, and Philip L. Merritt, assistant director for exploration, will continue to handle planning and technical direction in their fields.

R. H. Waddington has been appointed assistant to the vice president, International Nickel Company of Canada, Ltd., Copper Cliff, Ont., Can. **F. J. Morrow** is now superintendent of smelters and **L. N. Pearce**, assistant superintendent of smelters.

Howard G. Satterthwaite has been named manager of the Columbia Falls, Mont., aluminum reduction works of Anaconda Aluminum Co. Mr. Satterthwaite has been assistant general superintendent at the Great Falls, N. Y., reduction department. **James E. Smith**, assistant superintendent of the Great Falls copper refinery, is now production superintendent at Columbia. Carl J. Lundborg, assistant mechanical superintendent at Great Falls, has been appointed chief engineer at Columbia.

H. R. Banks, superintendent of the Sullivan concentrator of The Consolidated Mining and Smelting Company of Canada, Ltd., Trail, B. C., has been appointed consulting engineer, ore concentration. **A. G. Robertson**, special assistant to the manager of the metallurgical division, will succeed Mr. Banks as Sullivan superintendent.

T. G. Roy, after 24 years with the Oliver Iron Mining Division, U.S. Steel Co., on the Gogebic Range in Michigan, has retired as consulting engineer.

Thomas N. Walthier, geologist, has joined the New York, N. Y., Division of Raw Materials, Atomic Energy Commission. New geologists at Grand Junction, Colo. Exploration Branch are: **Edward Vincent Mace, Jim Cleveland Standard, Forrest R. Fincher**, and **John V. A. Sharp. Howard E. Geslin**, geologist, has joined the Denver, Colo. Exploration Branch, and **Wilmer R. Peterson**, mining engineer, has joined the Salt Lake Exploration Branch.

Max J. Kennard, chief engineer of all Combined Metals Reduction Co. operations, has been named general manager of Pioche Manganese Co., CMR subsidiary at Pioche, Nev. **K. K. Hood**, formerly general manager of Callahan Zinc-Lead Co., succeeds Mr. Kennard as chief engineer. **R. W. Lottridge**, in charge of construction at Pioche Manganese, is now manager at the Henderson plant. **F. R. Leonard**, metallurgist for CMR, is metallurgical assistant to the general manager of Pioche.

S. R. McCoy has been named controller for Hollinger Gold Mines Corp., Timmins, Ont. Accountant in 1920, Mr. McCoy was appointed assistant office manager in 1946.

Frank N. Marr, Spokane, Wash., is president-elect of the Northwest Mining Association. Mr. Marr, president of the Spokane-Idaho Mining Co. and director of several companies, succeeds **E. C. Stephens**, Spokane mining engineer, who has served two consecutive terms. **P. C. Fedderson**, superintendent of the Bunker Hill and Sullivan lead smelter at Kellogg, Idaho, and **P. Evans Oscarson**, Spokane consulting geologist, have been elected vice presidents. **E. K. Barnes**, Spokane, was re-elected treasurer for his sixth term.

Señor Oscar Flores, well-known Chilean mining engineer, has been named vice president of the Chilean Mining Bank.

John H. Forbes, foreman at the West Hill mine, on the Mesabi in Minnesota, has resigned to join West Indies Mining Corp. in Puerto Rico.

OBITUARIES

Evander Schley, 69, passed away on Dec. 2 in New York, N. Y. Mr. Schley was chairman of the board of the Howe Sound Co. and president and a director of the El Potosi Mining Co. and the Tintic Co. He was a limited member of the New York Stock Exchange of Moore & Schley, and a director of American Smelting and Refining Co., Calera Mining Co., and several other mining companies.

Lloyd W. Polsley died Nov. 9 near Meeker, Colo. Mr. Polsley had been associated with Engineers Syndicate, Ltd. and with Mountain States Uranium Corp., Bishop, Calif. At his death, he was on assignment with Tungsten and Uranium, Inc.

Ward Tuttle. 44, industrial relations superintendent for the Southwest Potash Co., Carlsbad, N. M., died Nov. 30. A graduate of the University of Utah, Mr. Tuttle was formerly employed by U. S. Smelting, Mining & Refining Co., Salt Lake City, Utah.

Frank S. Tower, 75, prominent California gold mining man, passed away Nov. 12 in San Andreas, Calif. Mr. Tower was owner-operator of the Royal mine at Hodgson in Calaveras County.

APPRECIATION

Lucien Eaton, Sr.

Lucien Eaton, Sr., the son of pioneer New England parents, was born July 6, 1879, in St. Louis, Mo. He departed this world Dec. 9, at Milton, Mass. A portion of his life was spent in Texas and he returned east where he graduated from Harvard in 1900, receiving his master's degree in 1902. He taught there for a year and then joined the staff of the Cleveland Cliffs Iron Co. in 1903, retiring from that organization in 1929 as superintendent of the Ishpeming, Mich. district.

Mr. Eaton served as a captain in the Army Engineers during World War I, was a Legion of Honor member of the AIME, a member of the American Mining Congress, and of the Mining and Metallurgical Society of America.

In 1929 to 1952, Mr. Eaton was active as a mining engineer and consultant, numbering among his clients various agencies of the federal government, several foreign countries, and a number of state governments. Well read, a traveler and excellent amateur photographer, author of numerous technical articles and books on mining subjects, he was ever an inspiration to his friends and companions. To those of us whom he guided from the shoals of junior engineering to the open sea of responsibility, his memory will serve as a beacon light.

HAROLD B. EWOLDT
Vice President
White Pine Copper Co.

E&MJ Calls on Dr. Phillip L. Merritt

ALTHOUGH THE COLORADO PLATEAU is liberally sprinkled with old-timers who will tell you that they mined uranium 50 years ago, it wasn't until 10 years ago that there was much point to mining it. The stuff came along with vanadium or even with some radium and sometimes glass manufacturers would use it for coloring. Then in 1943 Phillip L. Merritt surreptitiously began the task of procuring uranium for some experimental work being done by a mysterious agency known as the Manhattan District under General Groves. He is one of the few men who knows the uranium story from almost-cloak-and-dagger days of World War II to the multi-million dollar industry it is today and heavier than average portion of the responsibility of keeping the U. S. atomic energy plants supplied with uranium has fallen on his shoulders.

The uranium story for Merritt began with a lunch in the fall of 1942 when a representative of the Manhattan District spoke guardedly of some very important top secret work going on. He couldn't say much but what he did say, sprinkled liberally with names like Conant, Urey and Oppenheimer, interested Merritt, and in Oct., 1942, after the FBI's clearance check he went to work as an Army captain for the Manhattan District.

That clearance investigation must have revealed that Merritt was graduated with a degree in geology from the University of Minnesota in 1928 and soon thereafter had gone to work for Rhodesia Selective Trust. In 1934-35, he worked for the Department of Mines and Petroleum in Columbia after obtaining a PhD. from Columbia University. From 1936 until he started with the Manhattan District he was with American Cyanamid as a geologist and mineralogist, and worked on the development of Sink and Float processes.

Procuring enough uranium wasn't easy. Three available sources then known were Canada, Belgian Congo and tailings of the vanadium plants on the Colorado Plateau. Moreover uranium had to be purchased without attracting attention. On the Plateau, vanadium was ostensibly the government's interest. Local people guessed what was going on and some of the newspapers knew, but the secret was kept. Customs officials helped when uranium was imported in boxes with an amazing variety of labels addressed to private individuals. On inspection trips Captain Merritt wore civilian clothes. Nagasaki and Hiroshima testify that enough uranium was obtained. In recognition of his personal contribution, Merritt received the Legion of Merit.

In Jan., 1947, what is now the U. S. Atomic Energy Commission took over the development of atomic energy. Merritt, discharged from the Army as a major, continued on with the business of supplying the nation's uranium needs. As assistant director of the Raw Materials Div., he has seen his organization grow from a dozen people to more than 260.

Expanding the exploration arm of the Raw Materials Div. to keep up with the ever increasing demand for uranium, has been a monumental task. An ever present need exists for qualified technical men to take key positions in the program. An idea of the scope of the work carried on by Merritt's office can be obtained from the following figures: 5,000 mines examined; 60,000 mi. flown with airborne scintillometer; 40,000 samples, mostly from exploration done by the public, examined.

One of Merritt's biggest headaches comes from trying to please all the people all the time. He's beginning to feel it can't be done. Take the airborne prospecting program. Each month the results of the work are posted at several AEC offices simultaneously for the benefit of local prospectors. The information couldn't be distributed on a more impartial basis, yet there is a constant stream of complaints of partiality. Nevertheless, the job is being done, and done well, under Merritt's direction.

Merritt has been a major force in the extension of the uranium province of the Colorado Plateau from the 60,000 sq. mi. it was considered in 1945 to more than 130,000 sq. mi. today; the discovery and development of new districts in the United States, like Edgemont, So. Dak.; Grants, New Mexico. He has had much to do with the flow of uranium from So. Africa, Canada and soon perhaps Australia, into the hard-working atomic plants of this country.

Having followed the uranium story from a point of vague knowledge about a virtually unknown metal to a thriving, prosperous industry, Phil Merritt is optimistic about the future of the uranium business. And why not? Uranium has been actively sought for only 10 years and look at the achievements of both government and private industry.

But perhaps the most important comment on how well the job of furnishing uranium is being carried on, is the observation that no atomic energy plant in this country has missed a single shift's operation because of a lack of uranium.

teamwork in specialties

THE BLASTER

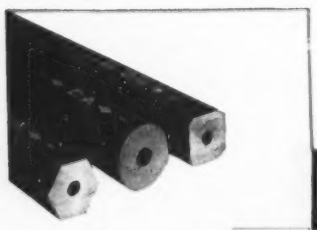
CRUCIBLE HOLLOW DRILL RODS

In rock-drilling operations, the blaster is a key man. He plans the blast, tells the drill-runners where to drill their holes, loads the charge for the greatest effectiveness.

He expects . . . and gets . . . peak efficiency from his men and the tools they use.

This is why Crucible Hollow Drill Rods rank first with crews supervised by top-notch blasters. Experience has shown them that Crucible rods stand the rapid-fire battering of modern rock-drilling longer; give them the least breakage, the greatest service life.

Crucible Hollow Drill Rods are right for the job because they are made by the world's largest producer of *tool and high speed steels*. From this metallurgical experience come the high mechanical properties that have set record after record for least cost per foot drilled. Use Crucible Hollow Drill Rods in all your drilling operations.



CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

HOLLOW DRILL RODS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

E & M J

NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

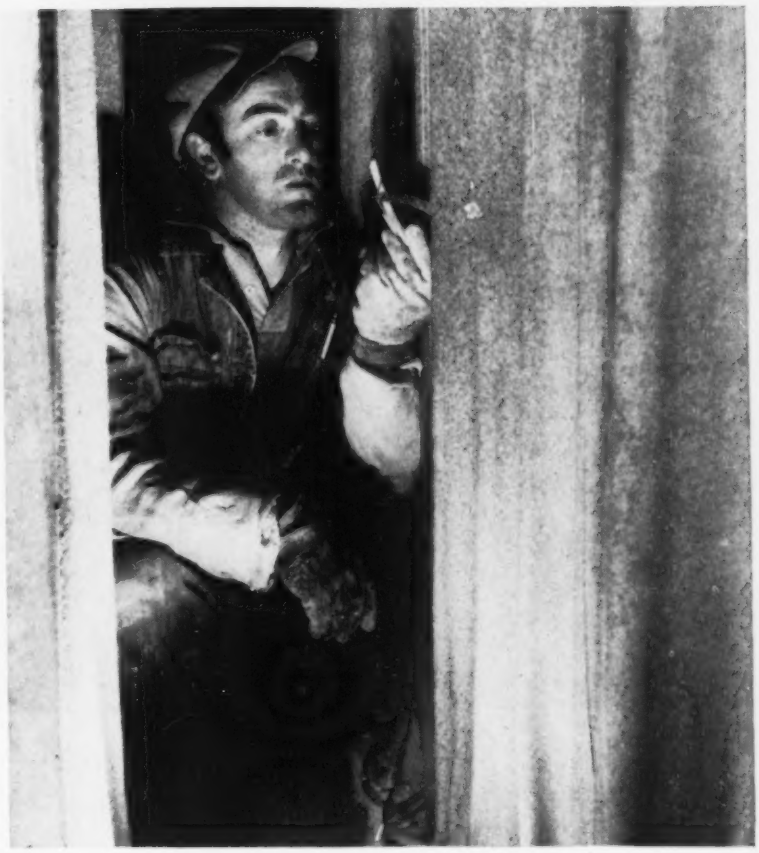
New Fiber Gives Excellent Service in Dust Fume Bags (1)

USE OF DYNEL, new man-made fiber, in dust fume bags employed in processing antimony at the Bradley Co.'s Yellow Pine Mine & Smelter, Stibnite, Idaho, has resulted in considerably longer use—life and operating economies, compared with the previous materials used, according to Frank P. Souders, superintendent of the smelter.

The plant uses 3,744 "FumeAll" bags of a 30% Dynel-70% wool blend to collect antimony oxide from the refined ore. These bags are in use around the clock, 24 hours a day, seven days a week.

Dynel, a development of Union Carbide and Carbon Corp., is a new textile made from natural gas and salt. Its combination of properties imparts to the blend specific advantages which compensate for the shortcomings of wool in this service, it imparts to the "FumeAll" bags longer life and improved efficiency under the rigorous operating conditions of the smelter's refining processes.

Dynel's contribution to the fabric includes a unique inherent resistance to corrosive chemicals and minerals, excellent dimensional stability and high wet and dry strength. It has been found that Dynel will support the basic wool filtering fibers long after they have been affected by acid and heat and have completely lost their strength. It is completely unaffected by antimony oxide.



In the 30% Dynel-70% wool blend, Dynel serves to stabilize the wool, minimize shrinking or stretching. The staple Dynel and staple wool are blended before carding in order that each section of yarn will have the proportions of the wool-Dynel combination. Because Dynel is a spun staple, rather than a continuous filament fiber, it helps give the bags a full-bodied, resilient texture, useful when working with powdery substances such as antimony oxide.

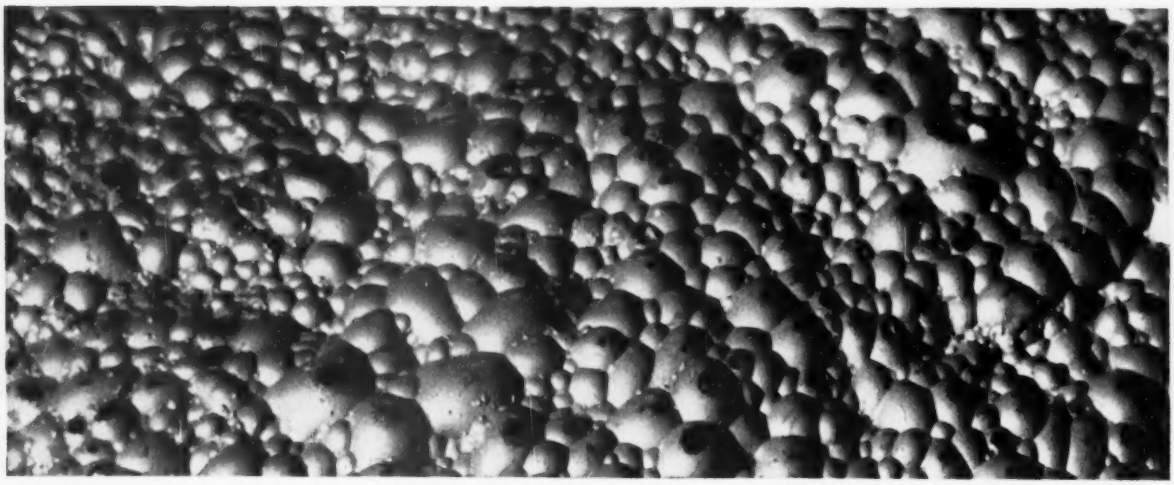
In addition, Dynel is mothproof, mildewproof and unaffected by bacterial action. It confers these properties in some degree to the blend.

The Dynel-wool "FumeAll" bag was developed in 1949 by Portland Woolen Mills. It was selected for use in the Yellow Pine smelter because of "FumeAll's" excellent performance under acid conditions, Mr. Souders reports. Its life is approximately 12 months or over, considerably better than that of materials previously used. It stands up under 4 in. of static pressure at temperatures of 200 deg. to 300 deg. F. Its cost is about three-fourths that of previous bags.

DOW

REDUCE FROTHER CONSUMPTION WITH DOWFROTH* 250

Quality frothing agent by DOW works harder on the machine for low-cost flotation with improved metallurgy



The ability of Dowfroth to build higher quality froth more economically is now well established. Many mills can testify to this. For example, at one mill Dowfroth 250 produced improved metallurgy with consumption one-fourth that of the previous frother used! For added economy, Dowfroth's water solubility results in its measurable return to the flotation circuit in water recovery systems.

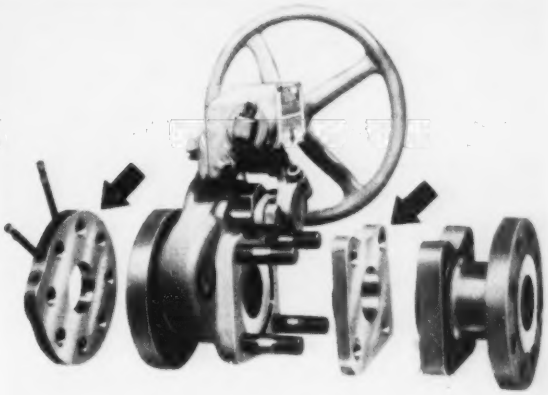
Dowfroth 250 is essentially free of collector properties, making it particularly effective for selective flotation. This superior frother is also easy to handle, can be stored in any climate, and is readily available.

Consider the economy and efficiency of Dowfroth 250 for your operation. Send for a *free sample*, from Dow, Dept. OC 3-33. THE DOW CHEMICAL COMPANY, Midland, Michigan. *Trademark

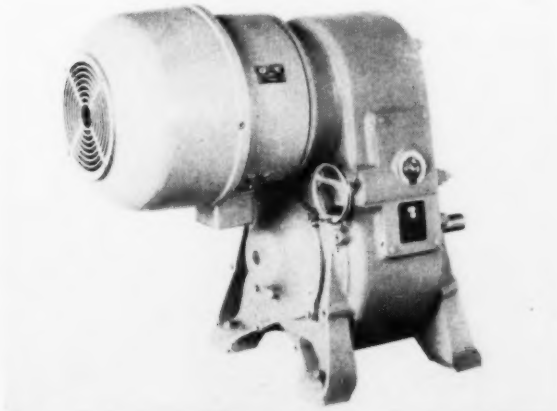
you can depend on DOW CHEMICALS

DOW

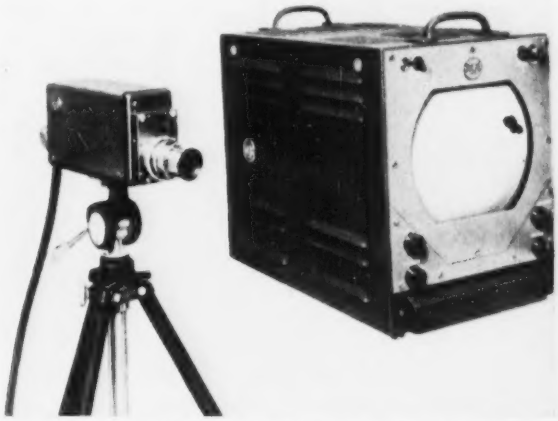
DUMPCRETE BODIES, mounted on Federal truck offer fast hauling and dumping for Michigan salt mine. Body, generally used for mixed concrete, has 6¼-cu.-yd. capacity Maxon Construction Co. (Mfg. Div.) (2)



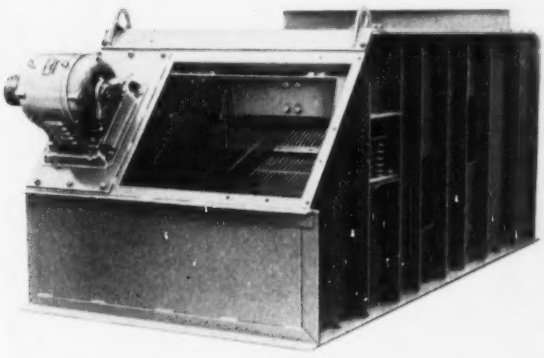
ELECTRICALLY-HEATED VALVES are available in sizes from 2 to 6 in., with heat inputs from 400 to 3,000 watts per unit. Elements transfer heat directly to valve seats. Okadee Co., Chicago, Ill. (5)



VARIABLE SPEED CONTROLS (Speed-Trols) and power drives in the range of 20 to 25 hp. with 2-1, 3-1, and 4-1 speed variation are available in totally enclosed fan-cooled models. Sterling Electric Motors, Inc. (4)



WIRED TELEVISION for industrial application features simplicity, compactness, low cost operation. Does not need excessive illumination. Lightweight unit works on 115-v., 60-cycle current. RCA Victor. (3)



VIBRATING GRIZZLY (Symons) will scalp 400 tph of wet, dry or sticky ore, with separations from ½ in to about 4 in. Heavy duty K-RG grizzly has 50-in. x 8-ft. screening surface. Nordberg Mfg. Co., Milwaukee. (6)

SKID-SHOVELS for International tractors has patented crowding action for bigger loads. All hydraulics are fully enclosed. Low clearance in all capacities from 1¼ to 3 yd. Drott Mfg. Corp., Milwaukee, Wis. (7)

SOLVENT cleans motors and generators while they are still assembled. Motor, submerged in solvent is turned on briefly, or solvent can be sprayed into it. Shaler Co., Waupun, Wis. (8)

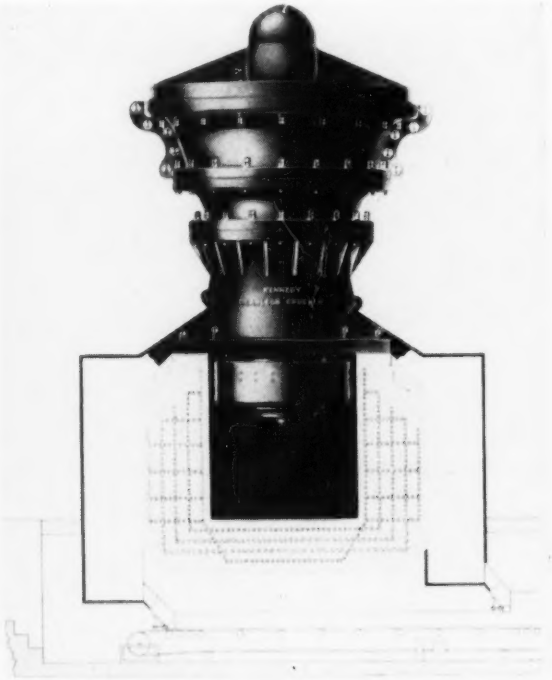
GLASS DRAWING TABLE uses Paraliner ruler to draw successive parallel lines at any interval with only one setting. Ruling measure has micrometer precision. Michael Lith Co. (9)

MICRO-TALKIE TRANSMITTER weighs 29 oz., has power output of 20-40 milliwatts, optimum range of 5 mi. Self-contained unit operates on 152-174 mc band. Motorola. (10)

TRUCK UNLOADER (11)

Shipments of coke and carbon products between International Graphite & Electrode Division and its parent company, the Speer Carbon Co., have been materially speeded up through the use of a hydraulically elevated truck unloader which can unload 20,000 lb. of coke from a trailer truck in one minute.

The unloader, built by the Kewanee Manufacturing Co., tilts both the tractor and trailer to a 40-deg. angle, dumping the coke into storage facilities where it is kept until processed for the manufacture of electrodes and other carbon and graphite products.



GYRATORY CRUSHER (12)

Here are the salient features of the new gyratory crusher made by Kennedy-Van Saun Mfg. & Engrg. Co.

1. Two discharge outlets built at 70-deg. angle.
2. Vertical 6-ft. drop separates rock from clay.
3. Rock passes through mantle and concaves at bottom.
4. Handles hard-to-crush rock containing as high as 50% clay without clogging.
5. Synchronous motor built into pulley assembly.
6. Starting torque of 250%; pull-out torque of 300%.
7. Gearless construction.
8. All moving parts on self-aligning roller bearings.
9. Eccentric and ball spray babbitted.
10. Recirculating forced-feed oiling system.
11. Automatic power shut-off if oil pressure fails.
12. No hydraulic jacks needed to adjust bottom plate.
13. Reductions to as fine as 1/16 in.

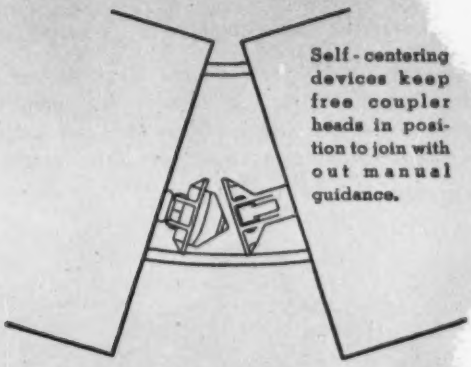
Ready to Join ANYWHERE, ANYTIME

O-B Couplers are Always in Position

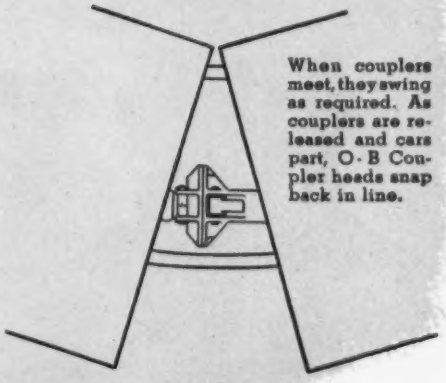
Self-centering devices hold each O-B Coupler head in line with its car centerline. Thus unengaged O-B Automatic Mine Car Couplers are ready to join at any point along the haulage way. Cars come together and fasten without guidance or assistance of any sort, because each self-centering O-B Coupler is in position to join with its mating head on the next car.

Once joined, the couplers of course swing to either side as required by the trip movement. But the moment a car is released, its coupler snaps back into position in line with the car center.

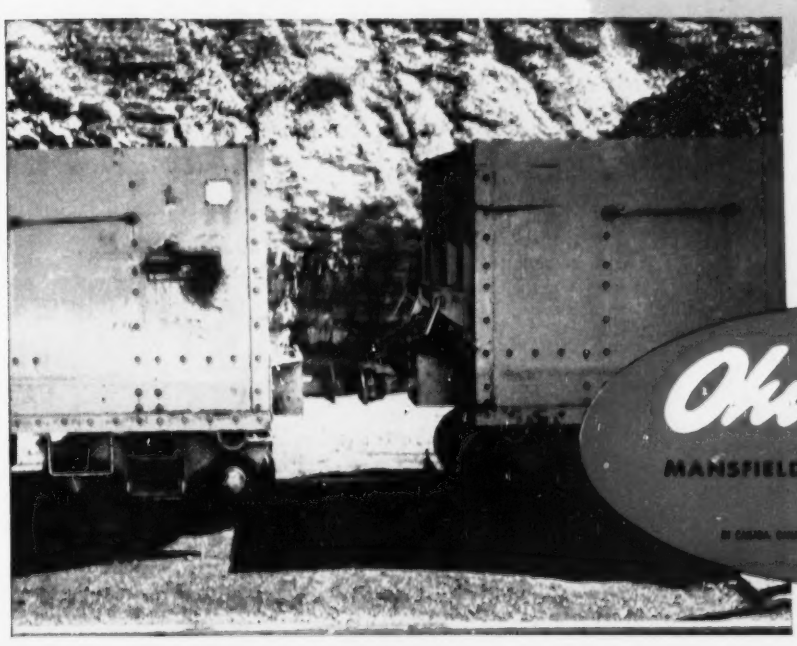
Because of their ability to join anywhere without adjustment or guidance, self-centering O-B Automatic Mine Car Couplers add speed and safety to haulage operations. That's one pretty good reason for choosing O-B for your new or remodeled cars!



Self-centering devices keep free coupler heads in position to join without manual guidance.



When couplers meet, they swing as required. As couplers are released and cars part, O-B Coupler heads snap back in line.



Just before coupling. Self-centering mechanisms have both heads in line with one another. No assistance is necessary.

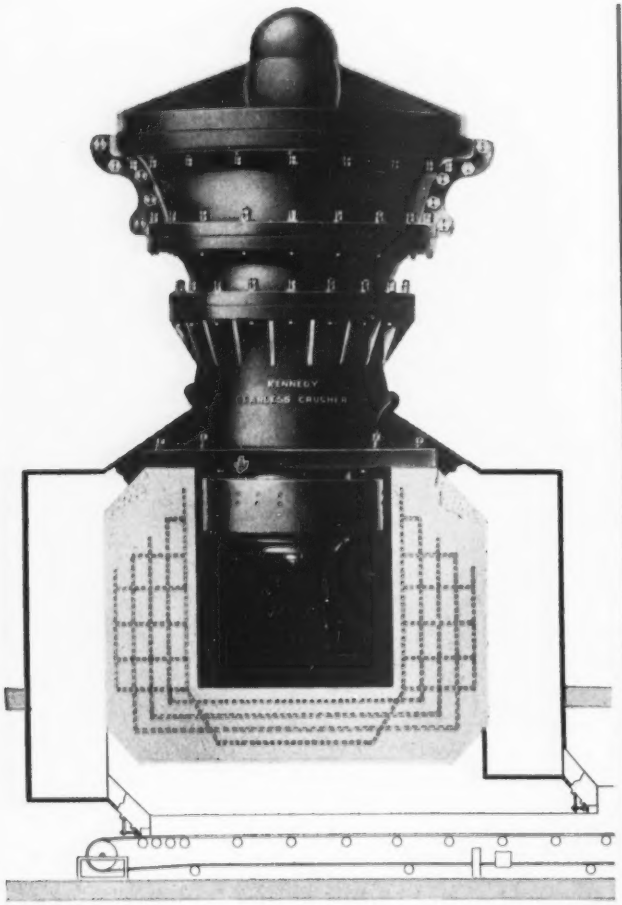
Ohio Brass

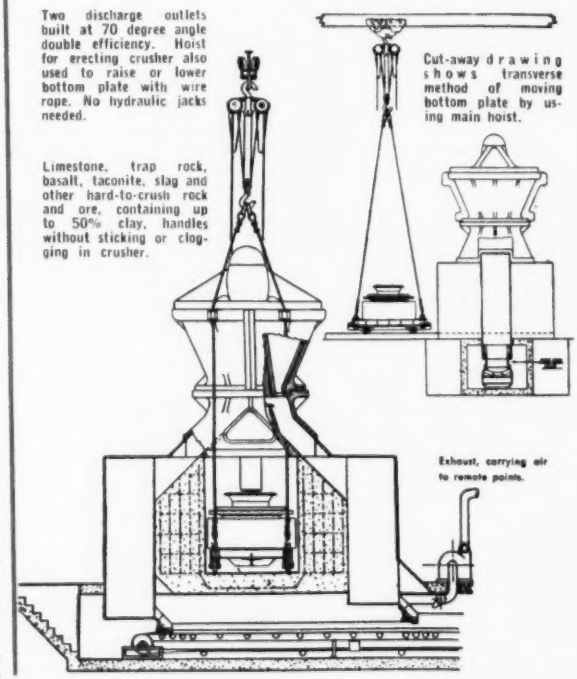
MANSFIELD OHIO, U. S. A.

4353-AM

KENNEDY PRESENTS THE GREATEST IMPROVEMENT
in gyratory crusher performance in a generation!

NEW DOUBLE DISCHARGE GEARLESS GYRATORY CRUSHER WITH TWO OUTLETS . . . *ENDS THE "STICKY ORE" PROBLEM!* Double discharge outlets built at 70 degree angle solve "sticky ore" problem! Easily crushes ore containing as high as 50% clay without clogging. Synchronous motor built into pulley assembly for sure crusher starting even when full of rock and ore. Gearless construction, frictionless operation. All moving parts carried on self-aligning roller bearings. Power is used only for the actual crushing. Economical recirculating forced-feed oil system. Automatic power shut-off. Primary, secondary types for any tonnage and sizing requirements.




Two discharge outlets built at 70 degree angle double efficiency. Hoist for erecting crusher also used to raise or lower bottom plate with wire rope. No hydraulic jacks needed.
Limestone, trap rock, basalt, taconite, slag and other hard-to-crush rock and ore, containing up to 50% clay, handles without sticking or clogging in crusher.
Cut-away drawing shows transverse method of moving bottom plate by using main hoist.
Exhaust, carrying air to remote points.

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
***FACTORY* DANVILLE, PA.**

Equipment Shorts

CORROSION-RESISTANT EXHAUST DUCTS. Corrosion-resistant manifolds and ducts are available in all-plastic, fully rigid construction from American Agile Corp., Bedford, Ohio. Fabricated from polyethylene or unplasticized polyvinyl chloride, both offering excellent resistance to corrosion, they are made to customer's specifications, square or round, and shipped in easy-to-assemble sections. (21)

ION-EXCHANGE VALVE. Cycloflow valve, developed by American Water Softener Co., Philadelphia, Pa., and primarily designed for controlling cycles of flow in ion-exchange equipment, completely eliminates all possibility of contaminating leakage by providing an isolated section connected to waste between the outlet and all sources of contamination. (22)

YELLOW PLASTIC PIPE. Plastex Pipe & Extrusion Co., Columbus, Ohio, are building the color yellow into their pipe. It can't fade or stain under any conditions. They say that this feature adds safety in mining because the pipe is easy to pick out in dimly lit areas. Then, too, the pipe can be positively traced and identified when used with other pipe lines or cables. (23)

SLIDE RULE MAGNIFIER. A double magnifier for duplex slide rules which permits accurate reading on both sides of the slide rule simultaneously, was introduced last month by Flatto Management Co., New York, N. Y. Although it has two lenses, it can be folded to make it less bulky. (24)

ALL-PLASTIC WELDING HELMET. American Optical Co., Southbridge, Mass., has announced the No. 700 Series welding helmet shell, made of thermosetting Fiberglas, reinforced with polyester resin. (25)

STEREO-MICROSCOPE. Offering a wide, three-dimensional field, this imported binocular microscope can be used for inspection, examination, counting, checking and dissecting. Trade-named Edscope, the unit sells for $75. Edmund Scientific Corp., Barrington, N. J. (26)

VIBRATING SCREEN. Hewitt-Robins Inc., Stamford, Conn., have a new vibrating screen equipped with a heavier yoke and mounted on coil springs instead of leaf springs formerly used. Springs are encased in a Neoprene rubber accordion-type boot to keep out sand and rock. Company claims this new screen will handle heavier loads than previous models. (27)

"PAINTED - ON" LUBRICANTS. Tough, adherent load-bearing dry lubricant finishes may now be applied to any machine or instrument surface, using ordinary brush or spray techniques without special equipment, by the use of new types of "Liqui-Moly" molydenum-base lubricating enamels, offered on an experimental basis by Lockrey Co., Southampton, N. Y. (28)

ALUMINUM COATING. Because of the special solvents used, a coating of Roylac aluminum dries upon 4 ft. travel from the spray gun nozzle. This means it can be sprayed on without spattering nearby objects or surfaces. In addition, the coating provides a tightly bonded corrosion-resistant film with a bright aluminum finish. Royston Laboratories, Blawnox, Pa. (29)

SAFETY FOOTWEAR. Feeling that long life and good service under arduous conditions like those encountered in mines and quarries are just as important to the wearer as the safety features, Protective Footwear Service Ltd., Bristol, England, have designed and are offering just such a shoe. (30)

GREASE FITTING. A giant button-head grease fitting with one-piece construction is now being manufactured by Universal Lubricating Systems, Inc., Oakmont, Pa., for use on all heavy industrial equipment. Fitting is aid to prevent leaking possible with conventional two-piece fittings. (31)

SHEAVES. A new type of "Magic-Grip" bushing has been announced by Allis-Chalmers Mfg. Co. for its stationary-control, wide-range "Vari-Pitch" sheave. The bushing makes possible quick and easy installation or removal of the sheave and permits mounting it on the shaft so that the adjusting control mechanism is either toward the motor or away from it. (32)

AIR-OPERATED VALVE. A pneumatically operated butterfly valve for control of air, water or steam flow has been developed by Minneapolis-Honeywell Regulator Co. Described as a Grad-U Motor power unit, the valve operates on a controlled air pressure range of zero to 15 psi. Adjustable mechanical stops on the motor enable the wing rotation to be limited for special applications. (33)

SILICONE INSULATION. A new silicone resin for Class H electrical insulation that maintains its bonding strength and hardness at temperatures 50 to 90 deg. C. above any known commercially available silicone resin, has been developed by the Chemical Division of General Electric Co., Pittsfield, Mass. (34)

WORK GLOVE. Plastic dots, permanently set into standard 10-oz. canton flannel make this new work glove outlast conventional canton flannel gloves by more than two to one, according to the manufacturer, Riegel Textile Corp., New York, N.Y. (35)

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after March 1, 1953, if mailed in the U. S. or Canada.

Engineering and Mining Journal—January, 1953
NOT GOOD AFTER FEBRUARY, 1953—If mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	41	48	55
2	9	16	23	30	42	49	56
3	10	17	24	31	43	50	57
4	11	18	25	32	44	51	58
5	12	19	26	33	45	52	
6	13	20	27	34	46	53	
7	14	21	28	35	47	54	

My Name ..... Position .....

Company .....

Address .....

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

RADORE METHOD. Wm. M. Barret, Inc. (Shreveport, La.) tells all about this new geophysical technique: how it works; what it can do; equipment required. Exploration men should have this in their files. (41)

HEAVY-DENSITY CONCENTRATOR. Well illustrated 12-page booklet shows how the Heavy Density system of Wilmot Engineering Corp., Hazelton, Pa., works. Contains engineering and specification data for nine different sizes, from 50 to 800 tph. (42)

INSTRUMENT TRANSMISSION SYSTEMS. Catalog T-50 discusses each of the transmission systems for instrument controls; pneumatic, magnetic, electric, electronic. Principles of operation and applications of each system are described, illustrated and diagramed. Fischer & Porter Co., Hatboro, Pa. (43)

FLEXIBLE TUBING. Where and how to use Spiratube, and what advantages it will give you are covered pretty thoroughly in catalog C3-4 from Flexible Tubing Corp., Guilford, Conn. (44)

CHANGE ROOMS. This is the most comprehensive booklet we have seen on design and layout of change rooms. Included is discussion on all points from the problem of locating the change room down to details recommended for benches. Many illustrations cover good practices in layout of the change room and type of equipment used. Moore Co., Charleston, W. Va. (45)

PUMPS. "Vertical Pumps for Volatile Fluids" describes the advantages of Johnston vertical turbine pumps for handling gasoline, diesel oil and other volatile liquids. Numerous cross-section drawings. Johnston Pump Co., Pasadena, Calif. (46)

PURIFIERS. How type Hi-eF purifiers, mechanical separators, save money by cleaning up steam, compressed air and gasses in your pipe lines is told clearly and concisely, with illustrations, in an eight-page folder released by V. D. Anderson Co., Cleveland, Ohio. (47)

DIESEL ENGINE. Bulletin 10027 on the TS diesel engine incorporates sectional wash drawings, installation views and diagrams to show why the TS diesel is called a smaller, lighter but fully heavy duty engine. Ingersoll-Rand Co., New York, N. Y. (48)

CARBON MONOXIDE DETECTOR. Special features, functioning, parts and application are illustrated and described in this 12-page bulletin from Taller and Cooper, Brooklyn, N. Y. (49)

WINCH-HOISTS. Lug-All Co. (Wynnewood, Pa.) offers a four-page folder on its hoists and accessories. The lightweight units (8.75 lb.) handle 1½ tons in an amazing number of applications. (50)

COMMUNICATION. "Instant Communication" is an eight-page booklet showing how to use two-way radio for better coordination of men, material and machines. General Electric Co., Syracuse, N. Y. (51)

TURRET TRUCKS. Claimed to be low-cost units for moving material horizontally, turret trucks handle anything that can be palletized, handled on skids, in tote boxes, or loaded on a platform. Catalog from Hyster Co., Portland, Ore., tells all about the turret truck. (52)

PULMONARY VENTILATOR. This easy to use instrument is designed for the relief of respiratory ailments. It can be used for the application of aerosols and has been used in treating bronchial asthma, bronchiectasis, chronic bronchitis, emphysema, pneumonitis and silicosis. Mine Safety Appliances Co., Pittsburgh, Pa. (53)

V-BELT. The "Texrope" grommet V-belt, for which 20 to 50% longer life is claimed is described in bulletin 20B-6497A released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. (54)

PLASTIC PIPE. A 16-page bulletin contains all pertinent information on four types of plastic pipe: flexible, semi-rigid, rigid high impact and rigid polyvinyl chloride. Along with chemical and physical characteristics, are the advantages of using it and simple installation directions. Triangle Conduit and Cable Co., New Brunswick, N. J. (55)

ANALOG COMPUTER. You've read about this marvel. Now here is the chance to see it close up. A 12-page catalog not only gives full product description and specifications, but discusses the general theory of analog computers and shows how to set up problems for solution. Three pages of typical examples in various fields of dynamics illustrate these principles. Computer Corp. of America, New York, N. Y. (56)

LUBRICANTS. Bulletin 95 on Molykote lubricants includes complete technical information on all standard and industrial grades and compositions. Contains price, packaging and ordering data. Alpha Corp., Greenwich, Conn. (57)

TIMBER CONNECTORS. This is six pages all about Trip-L-Grip anchors, an economical connector for all kinds of timber framing. Plenty of information on where and how to use. Timber Engineering Co., Washington, D. C. (58)

FIRST CLASS
PERMIT NO. 64
(Sec. 34.9, P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in The United States

Postage Will Be Paid By—

McGRAW-HILL PUBLISHING CO., INC.
ENGINEERING & MINING JOURNAL
330 WEST 42nd STREET
NEW YORK 36, N. Y.

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, on reverse side, tear out and mail.

OPEN-HOUSE CEREMONIES accompanied the opening of Link-Belt Co.'s 17th plant last month. Located at Colmar, Pa. 25 mi. north of Philadelphia, the 300,000-sq.-ft. plant will produce custom-designed conveying and processing machinery. Visitors saw in production, equipment for handling Venezuela iron ore at the rate of 6,000 tph. Plant layout is designed for future expansion.

Memos from the Manufacturers

First use of a transistor in VHF radio transmission has been reported by the Victor Division of Radio Corporation of America. This historic bit of communication was conducted on an experimental basis with home-made equipment. The transistor station, making a regular amateur transmission, contacted three "hams," one of them 25 mi. away.

Alcoa will spend $1,720,000 to substantially increase the cable-producing capacity of its Vancouver (Wash.) Fabricating Works. Project should be complete in late 1953. Just last month work was started on new ingot-casting facilities to be finished in May at a cost of $1,200,000.

Chaotic practices in drafting rooms of Great Britain, Canada and the U. S. are dangerously impeding the NATO rearmament effort. At least that's what W. L. Batt told a recent meeting of the American Standards Association. He recommended that management let engineers take steps to clear up the confusion by standardizing practices in the three countries.

Last open-hearth furnace in Timken Roller Bearing Co.'s steel operation was dismantled in November. A new 80-ton electric top-charge furnace has taken over.

Sparkling-white, premium-grade aluminum trihydrate will be commercially available come February. Reynolds Metals says this is the first time manufacturers have been able to produce an aluminum hydrate naturally snow-white in color.—There seem to be more shades of white these days!

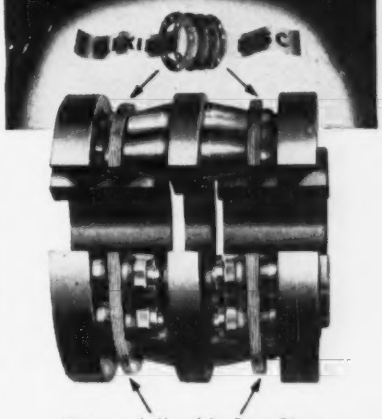
Snap Judgement: Would-be inventor, trying to sell an invention on a royalty basis finally got the chief development engineer of one of the country's larger manufacturing companies to look it over. After a short study, the engineer's report was brief: "This machine incorporates a lot of new and good ideas. Unfortunately, the new ideas aren't good and the good ideas aren't new."

CANADA'S FIRST refinery for the production of pure tungsten carbide directly from tungsten ores by electrosmelting and chemical methods, is the Macro Division of Kennametal Inc., at Port Coquitlam, B. C.

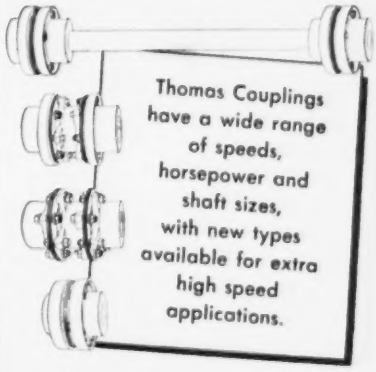
Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs

Distinctive Advantages of THOMAS FLEXIBLE COUPLINGS

- NO MAINTENANCE
- NO LUBRICATION
- NO BACKLASH
- NO WEARING PARTS



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Thomas Couplings have a wide range of speeds, horsepower and shaft sizes, with new types available for extra high speed applications.

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

NO MAINTENANCE PROBLEMS

ALL PARTS ARE SOLIDLY BOLTED TOGETHER

Write for our new Engineering Catalog No. 51

THOMAS FLEXIBLE COUPLING CO.

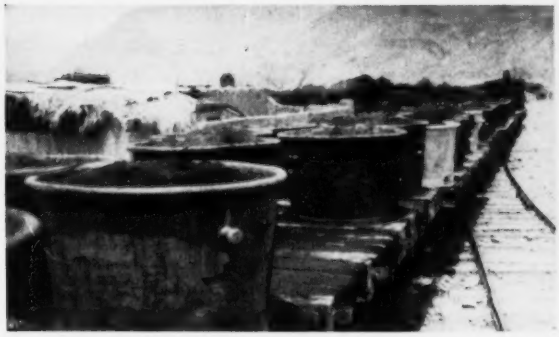
WARREN, PENNSYLVANIA, U.S.A.

SAN MANUEL copper minesite—where Magma Copper Corp. will build Arizona's seventh largest city

Tide's Amplitude Poses Ore-Loading Problem—Australian Engineers Solve It

TWO HOURS AFTER a launch skirted the high-water mark seen running along the cliff base (at left) of Australia's Cockatoo Island, this jeep was able to thread its way down the beach over a solid foundation of coral. Maximum diurnal tidal variation here is 35 ft. Engineers of Australian Iron and Steel, Ltd., subsidiary of Broken Hill Proprietary Co., Ltd., came up with the solution (shown at right) to the problem this presented to iron-ore loading. A hinged boom 123 ft. long, having an angular range of 19½ deg., is operated by a winch and steel ropes controlled by the 80-ft. steel tower projecting above the loading dock. It is capable of continuously loading a 10,000-ton ship in all tidal conditions, will handle upwards of 750,000 tons a year of crushed ore from the present mine site. Shipment is to Port Kembla, 3,000 mi. away, and to Newcastle, 120 mi. north of Sydney.

THIS MONTH IN MINING



LOADED WITH ORE, these steel containers are hauled by rail from Chilete to port, transferred to ships by mobile cranes.

MILL AT RIGHT has treated more than 7,000 tons of ore in a month. Offices and laboratory appear in foreground, living quarters in the distance.

Chilete Mine, Mill Go into High Gear

NORTHERN PERU Mining and Smelting Co.'s lead-zinc mine and new 250-ton selective flotation mill at Chilete (Peru) commenced production in May 1952 and quickly reached the rate established for full-scale operation.

In October a little over 7,000 short tons of ore was milled, yielding 439 tons of lead concentrate averaging 65.24% lead and 42 oz. of silver and 1,364 tons of zinc concentrate averaging 54.75% zinc. Scheduled monthly rate of ore to be treated was 7,000 tons.

Aggregate tonnage milled to October's end is 37,755 tons.

The mine, 3,600 ft. above sea level, is in the department of Cajamarca about 2.2 mi. northeast of the town of Chilete. The main transportation level, at 3,500-ft. elevation, is an 8-by-8-ft., 2-mi. tunnel graded 0.5%, to which ore is handled by gravity. A storage-battery locomotive hauls ore in 2-ton rocker dump cars. The portal is near the top of the mill's coarse ore bin. Water-spraying nozzles are being installed for dust control, and a 25-hp. electric fan has been ordered to improve underground ventilation. About 125 men work underground two shifts a day, six days a week.

The mill is operated three shifts a day, seven days a week; employs 33 men. Without walls on its protected north side, its windows are corrulux —a light green, translucent plastic. Siding is eternit—corrugated sheets of an asbestos-cement mixture, locally produced. Dust control in the crushing plant will be effected by a rotoclone.

Concentrates are trucked to Chilete in steel containers, taken to port by the Pacasmayo R.R. Five-ton mobile cranes load concentrate containers on railroad and docks. Lead concentrate is shipped to the Selby (Calif.) smelter of American Smelting and Refining Co., Northern Peru's parent. Zinc concentrate is sent to unaffiliated Continental European smelters.

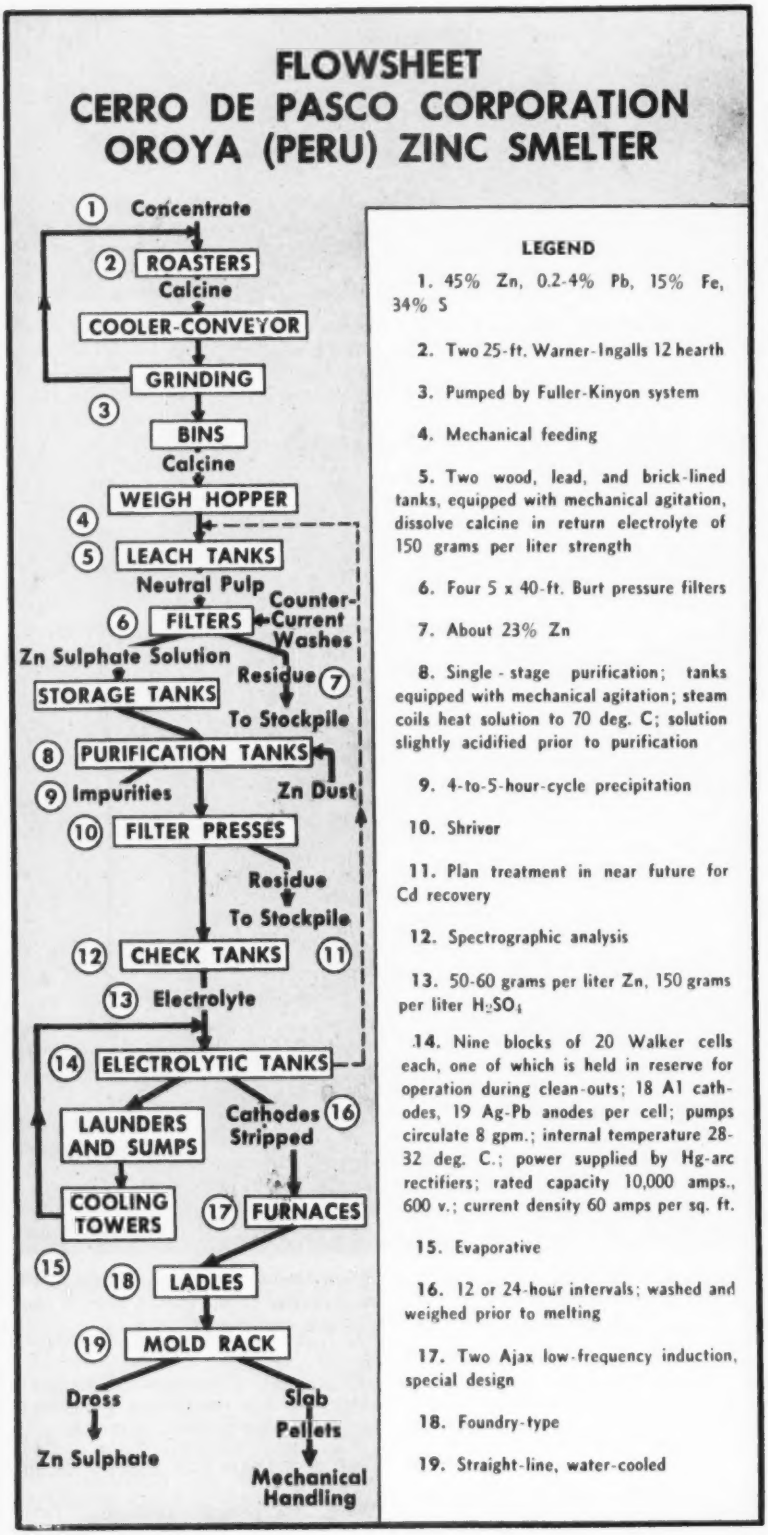
VIEW FROM NORTH SIDE of the mill shows mine's portal (background at left) and illustrates the path over which ore is carried to the mill. A part of the industrial area appears in the foreground.

Staff geologists are expanding geological study of the mine concurrent with progress of underground development and are conducting a general reconnaissance outside the mine.

The deposit is contained in a faulted block of volcanic rock about 5 mi. in

(Continued on page 130)

Cerro de Pasco's New Electrolytic Refinery Heralds Peruvian Ascendancy as Zinc Producer


FLOWSHEET
CERRO DE PASCO CORPORATION
OROYA (PERU) ZINC SMELTER
1 Concentrate
2 ROASTERS
Calcine
COOLER-CONVEYOR
GRINDING
3
BINS
Calcine
WEIGH HOPPER
4
5 LEACH TANKS
Neutral Pulp
6 FILTERS
Counter-Current Washes
Zn Sulphate Solution
STORAGE TANKS
Residue 7
To Stockpile
8 PURIFICATION TANKS
9 Impurities
Zn Dust
10 FILTER PRESSES
Residue
To Stockpile
12 CHECK TANKS
11
13 Electrolyte
14 ELECTROLYTIC TANKS
LAUNDERS AND SUMPS
Cathodes Stripped 16
COOLING TOWERS
17 FURNACES
15
18 LADLES
19 MOLD RACK
Dross
Slab
Pellets
Zn Sulphate
Mechanical Handling
LEGEND
1. 45% Zn, 0.2-4% Pb, 15% Fe, 34% S
2. Two 25-ft. Warner-Ingalls 12 hearth
3. Pumped by Fuller-Kinyon system
4. Mechanical feeding
5. Two wood, lead, and brick-lined tanks, equipped with mechanical agitation, dissolve calcine in return electrolyte of 150 grams per liter strength
6. Four 5 x 40-ft. Burt pressure filters
7. About 23% Zn
8. Single-stage purification; tanks equipped with mechanical agitation; steam coils heat solution to 70 deg. C; solution slightly acidified prior to purification
9. 4-to-5-hour-cycle precipitation
10. Shriver
11. Plan treatment in near future for Cd recovery
12. Spectrographic analysis
13. 50-60 grams per liter Zn, 150 grams per liter H_2SO_4
14. Nine blocks of 20 Walker cells each, one of which is held in reserve for operation during clean-outs; 18 Al cathodes, 19 Ag-Pb anodes per cell; pumps circulate 8 gpm.; internal temperature 28-32 deg. C.; power supplied by Hg-arc rectifiers; rated capacity 10,000 amps., 600 v.; current density 60 amps per sq. ft.
15. Evaporative
16. 12 or 24-hour intervals; washed and weighed prior to melting
17. Two Ajax low-frequency induction, special design
18. Foundry-type
19. Straight-line, water-cooled

DONALD I. GRIFFIS
McGraw-Hill World News

LIMA, PERU — Inauguration of Cerro de Pasco Corp.'s new electrolytic zinc refinery at Oroya is only the first step in the company's long-range plan to develop the rich Cerro lead-zinc orebody and other promising deposits in the Casapalca, San Cristobal, and Morococha districts and put Peru on the map as one of the world's major zinc producers.

The Oroya plant, capable of 35-ton-a-day output, is based on pilot-plant design, but incorporates a number of more recent innovations. For details, refer to the flowsheet elsewhere on this page.

Overall program calls for eventual daily production of 200 tons refined zinc, includes two additional 35-ton units now under construction. Implementing it are Cerro de Pasco's participation in New Jersey Zinc Co.'s development of the Sterling process and the corporation's Paucartambo hydroelectric project, begun in 1951. This plant, at Yaupi, 19 km. downstream from the confluence of the Huachon and Paucartambo, Amazon tributaries, will have ultimate capacity of 64,800 kw. It will consist of three generators each driven directly by a single overhung, double-jet, Pelton-type waterwheel rated at 28,000 hp. The 100-km. access road includes a 56-km. stretch built by Cerro and 44-km. of government-constructed road recently improved by the corporation.

Parallel plans include diversion of the Rio Colorado, already completed, and installation of a fourth unit at Malpaso, increasing that station's capacity by 7,000 kw.

Chilete Mine, Mill *(Continued)*

diameter, surrounded by sedimentary rocks. Fissure-type veins vary in width from about 1½ to 6½ ft., and minor mineralization replaces and impregnates adjoining country rock. Vein minerals are mostly brown-to-blackish sphalerite, galena, pyrite, and quartz. There's a good deal of calcite and gypsum. Extending from about 30 to 100 ft. below the outcrop is an oxidized zone containing lead carbonate ore with considerable silver.

Development includes a 770-kw. power plant, a machine shop, assay and research laboratory, warehouse, repair garage and carpenter shop, a road system, housing, a hospital, school, market, police station, offices, and power, telephone, water, and sewage lines.

Willis R. Griswold is manager.

How to make

OLD SHOVEL PARTS OUTLAST NEW ONES!

if you want more service from wearing shovel parts protect them with STOODY ALLOYS

ORIGINAL EQUIPMENT SIZE IS RETAINED. As most parts lose size, they also lose efficiency . . . worn teeth and worn bucket lips don't take a full bite. Worn idlers, pads and rollers cause trouble and delay. *Stoody Alloys give the protection where you need it, maintain all-important size!*

CONCENTRATED WEAR AREAS RECEIVE EXTRA PROTECTION. Bucket sides and bottoms develop distinct wear patterns. A few stringers of hard-metal in these areas slow down effects of wear, equalize overall bucket life.

LESS DOWNTIME—FEWER REPLACEMENTS. Hard-facing usually doubles part life. On specific items, increases up to 3 or 4 times have been noted. *Keeping parts in operation means less downtime for repairs, fewer costly replacements!*

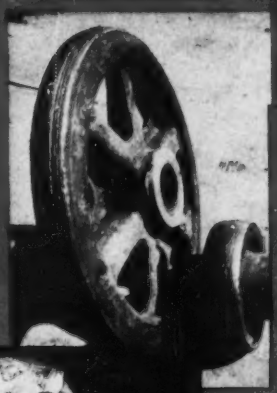
Why not get the most from your shovels by hard-facing now with STOODY ALLOYS?

Available for manual or automatic welding methods.

TRACK PADS renewed with Stoody 1027 are good for double original life.

BUCKETS AND TEETH need horizontal stringer beads of Stoody Self-Hardening 21. Stringers catch earth, form wear barriers.

HARD-FACED SHEAVES stay smoother, rope lasts longer because sheaves resist grooving. Automatic hard-facing with Stoody 107 does the trick economically—adds many times to life.



IDLERS AND TRACK ROLLS are ideally hard-faced by automatic process using Stoody 102 and Stoody 103 . . . Maintains size and shape, doubles life.

DRIVING TUMBLERS are supersized or easily rebuilt by manual application of Stoody Self-Hardening or Stoody 1027, outwear new parts 2 to 1

Consult your nearest Stoody Dealer listed in the Yellow Classified Telephone Directory under Welding Equipment & Supplies. He will recommend the BEST *Stoody Alloy for your job and provide a list of local job welders having Automatic Welding facilities—or write direct.*

STOODY COMPANY
11940 E. Slauson Avenue
Whittier, California

They did...

HOW these results were produced is the core of this story. CW&F came to us with a question on *method*—not for quotations on a device.

what...

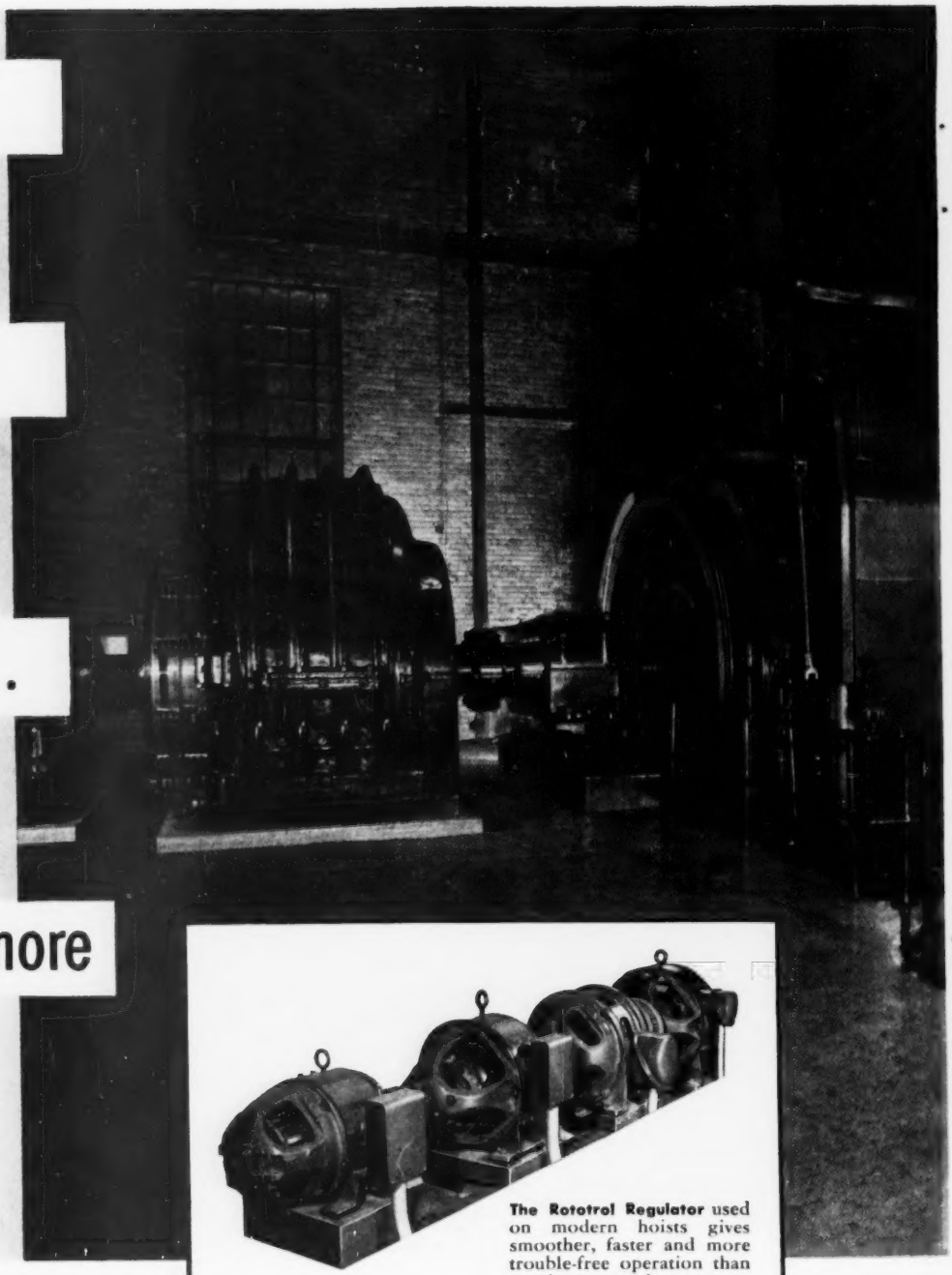
The answer was worked out with Nordberg and the CW&F engineers by our staff. They attacked the problem as a whole . . . and put together an *integrated* electrical and mechanical system of many devices.

you can do...

This method works for every mining process. In any electrical project, the devices themselves are secondary . . . it's how they're put together that counts.

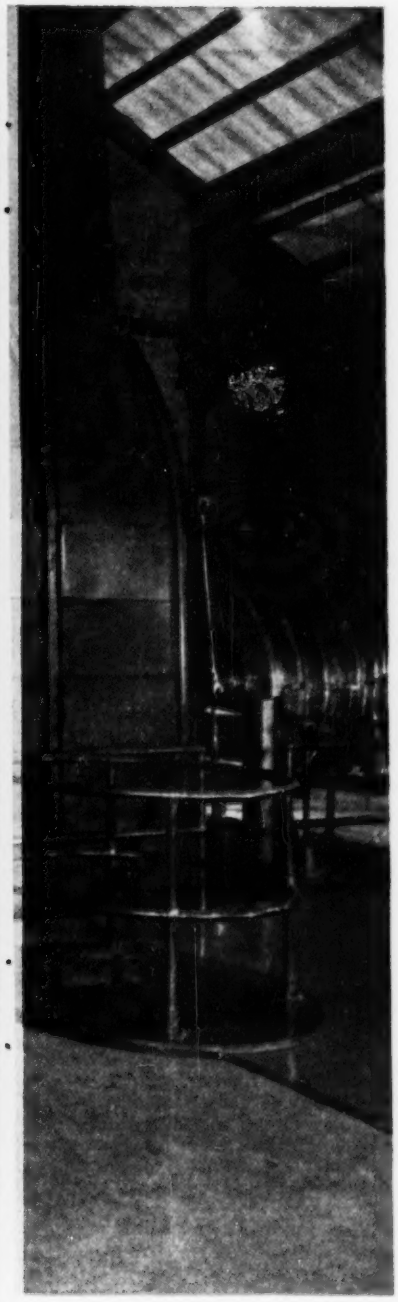
to produce more

Developing integrated electrical systems that make mining more productive has been one of our major activities for 50 years. Your Westinghouse office is a good place to go when you have a job for electricity.



The Rototrol Regulator used on modern hoists gives smoother, faster and more trouble-free operation than previous control systems.

The story behind the *World's Record-holding Hoist*



Twenty-seven years ago the Chicago, Wilmington & Franklin Coal Company had a certain problem. How they solved it has a bearing on a number of problems you probably have today. CW&F president George B. Harrington tells the story:

"Astonishingly trouble-free operation"

"In 1923 my company decided to open one big new mine, instead of what would have become two good-sized operations. This decision raised a problem however—whether one hoist could lift more than 12,000 tons per shift the necessary 600 feet. After many slide-rule hours and with prayerful acquiescence on our part, we installed a combination of Westinghouse equipment and Nordberg hoist—new and exceptional in design. It has given astonishingly trouble-free operation ever since."

Never a major repair, none contemplated

In 1928 this hoist made the world's coal hoisting record—15,175 tons in one 8-hour shift. Yet the hoist has never required a major repair—and none is contemplated now. The motors and generators have their original windings, bearings and commutators. At no time in 27 years has a failure of this equipment caused lost production.

New Westinghouse equipment is even better

Westinghouse keeps close to mining problems and new hoist drives are even better than this record holder. Some new ones are completely automatic; don't need an operator at all. Rototrol® control is now used. It needs less maintenance and results in smoother operation.

Call Westinghouse early on every job

These results are typical of the performance Westinghouse builds into *all* electrical equipment for mining. When you're planning *any* new project, call in Westinghouse early. J-94898

YOU CAN BE SURE... IF IT'S

Westinghouse

EQUIPMENT FOR MINING

THE VICTAULIC® METHOD OF PIPING

EASIEST WAY TO MAKE ENDS MEET

TEES . . . ELBOWS . . . REDUCERS . . . the Victaulic Method features a complete line of modern, top efficiency, Full-Flow Fittings for use with world famous Victaulic Couplings!

The Victaulic Method assures a complete, modern system of piping . . . fast, efficient hook-ups that simplify and streamline construction . . . cut costs! Victaulic Couplings offer easy-to-install, leak-proof connections . . . a union at every joint . . . assured trouble-free service under pressure or vacuum. Victaulic Full-Flow Fittings specially designed for use with Victaulic Couplings provide wide adaptability and complete versatility in construction. And to make the Victaulic Method complete—"Vic-Groover" Tools groove standard pipe easily and quickly . . . provide handy, portable equipment for preparing pipe right on the job!

Try the VICTAULIC METHOD on your next piping job. New construction . . . repairs . . . alterations—you'll find that the Victaulic Method *is the easiest way to make ends meet!*

Write today for Victaulic Catalog and Engineering Manual No. **44-8C**

28th VICTAULIC YEAR

VICTAULIC
COMPANY OF AMERICA
P. O. Box 509 • Elizabeth, N. J.
Office and Plant: 1100 Morris Ave.
Union, N. J.
Telephone: Elizabeth 4-2141

California: Victaulic Inc., 2330 East 8th Street, Los Angeles 21
Canada: Victaulic Co. of Canada Ltd., 406 Hopewell Ave., Toronto 10
Export: Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

Copyright 1952, by Victaulic Co. of America

NEWS BRIEFS

Neptunium appears in nature —so goes a report circulated in Brussels. It said the transuranium element, until now believed never to have existed except as an artificial product of man-generated nuclear bombardment, has been detected in pitchblende occurring in the Belgian Congo. Maybe finer spectral analyses will show that there isn't—after all—anything new under the sun.

•

A pattern may have been set by terms of a lease agreement assuring uranium miners of uninterrupted opportunity to work lands covered by prior federal oil and gas leases. Terms of the agreement, announced by Sheldon P. Wimpfen, manager of AEC's Grand Junction, Colo., operations office, following consultation with Interior Department officials, might be applicable in cases where conflict arises on lands withdrawn for other reasons.

•

Fast write-offs were granted to M. A. Hanna Co., Cleveland, by DPA on 70% of $22-million to be invested in a plant to produce ferronickel and 85% of $3.5-million to be spent for a plant at Riddle, Ore., to produce primary nickel. DMPA was still negotiating a contract with Hanna for smelting and refining nickel. Electric furnaces for ferronickel production will be powered by California-Oregon Power Co., which remains unscathed by shortages plaguing other Pacific Northwest utilities. The nickel plant is expected to adopt new processes developed by Bureau of Mines metallurgical laboratories at Albany, Ore., for beneficiation of low-grade silicate-type ores. The company's Oregon claims, extensively explored by Hanna Development Co., are centered at Nickel Mt., known also as Piney Peak. The primary nickel plant is to be operated by Hanna's subsidiary, Hanna Coal and Ore Corp. On station at Riddle are Walter Foster, Hanna Development geologist, and Roy Rannells, Hanna engineer.

•

Upwards of 1,600 members from throughout the Western Hemisphere are expected to be on hand for AIME's 175th annual meeting Feb. 16-21 in Los Angeles. This will be the first Los Angeles meeting in the history of the Institute. Southern California Section will be host.

•

Steps to encourage multilateral trade and a move toward currency convertibility are on the agenda of President Eisenhower and his GOP lieutenants the way European experts have it figured. So says a N. Y. Times dispatch from Paris, which tells of speculation on the Bourse suggestive of a new dollar-gold ratio.

•

International Materials Conference won't ration cobalt in the first

quarter. Projected output for the quarter is 2,800 metric tons, compared to 2,100 tons produced by free-world nations at the outset of rationing, and production is expected to keep right on growing.

•

M. B. Nicholls, president of Nicholls Minerals Corp., has been in Lima, Peru, on business concerning the Latin nation's heavy metals. It's understood his firm will serve as consultants to Peruvian mining interests and, exclusively, as sales agents for developed values to be exported to the U. S. Nicholls is a director of Carborundum Metals Co., Akron, N. Y., where facilities are being built for production of zirconium and hafnium metal sponge for AEC.

•

President Paul Natchman, of Mexican Gulf Sulphur, said recently that Mexico would produce 200,000 tons of sulphur in 1953, more than 500,000 tons in 1955.

•

Union Miniere du Haut Katanga expects to complete Societe Matallurgique du Katanga's new zinc plant at Kolwezi, in the Belgian Congo, in May, produce 36,000 tons of zinc a year.

•

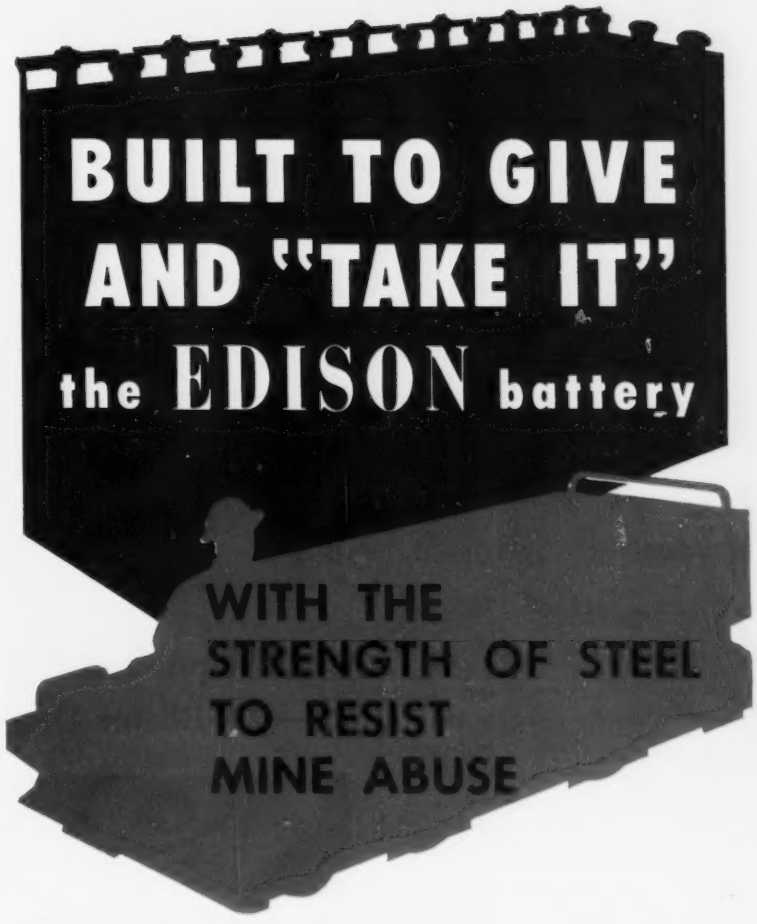
Look for the Japanese Government to petition the U. S. for permission of Japanese nationals to do business in the South Pacific region under U. S. Trusteeship. Pinched by war-time loss of overseas resources, General Clark's ban on fishing in waters around Korea, and the Chinese trade ban, former officials of South Pacific Development Co. and South Pacific Promotion Co. are anxious to mine phosphate ore on Fais, Sonsoul, and Ebon islands. (They are now permitted to develop phosphate mines on Angaul.) One-time South Pacific Aluminum officials would develop bauxite deposits on Palao Island in the Carolinas, could produce 60,000 tons a year.

Rumor Says Inland Has Big Iron Find

IN THE FALLS BAY AREA of Steep Rock Lake, Ont., where Inland Steel Co. has been diamond-drilling during the two previous winters on holdings taken under option from Steep Rock Iron Mines, Ltd., Inland is reported to have turned up 100-million tons of proved and probable iron ore. Grade disclosed in drill cores is said to be excellent.

Drilling is expected to continue this winter. All drilling in the last two winters has been through the ice. Water remaining in the Falls Bay area is 200 ft. or more deep.

The area south of that which is under option to Inland is in turn under option to a group of companies headed by Pickands, Mather & Co. The latter group had done no drilling up to this fall so far as is known.



all-steel cell construction—With *steel* negative plates, *steel* positive plates and *steel* cell containers, EDISON batteries are built to take real punishment. They've been in locomotives that have fallen down mine shafts and rolled down dumps . . . yet have gone right back on the job.

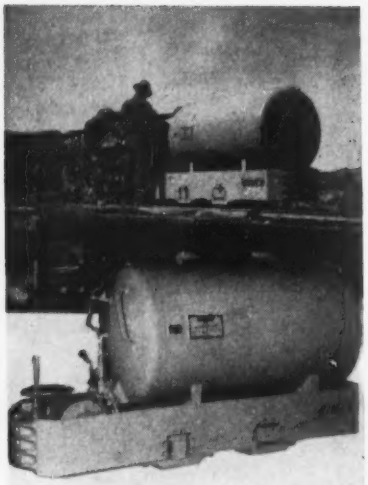
tough electrically—EDISONS won't be injured by accidental short circuits, reverse-charging. And you can fast-charge them with off-peak power or directly from d-c lines.

longer, dependable service—Because EDISONS usually give more than double the life of other types of batteries . . . with a lower depreciation cost and less downtime . . . you can't beat them in terms of over-all economy and greater dependability.

Send for Bulletin S.B. 3826 and the address of your Edison field engineer. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N.J.

Most Dependable Power —Lowest Over-all Cost . . . you get both with an EDISON

EDISON
Nickel · Iron · Alkaline
STORAGE BATTERIES



Eimco 2 Speed Air Locomotive

The Eimco 2 speed air locomotive is the answer to economical car handling. It has a definite application in the small mine and prospect drift. It is also being used efficiently in large mines for gathering, switching and in isolated exploration work. Contractors with short runs (up to 2,000') are using their Eimco locomotives with good success.

The principal advantage of Eimco Locomotives is its two speed constant mesh transmission allowing the operator to start the load in low and shift immediately to high. This feature, exclusive on Eimcos, gives you greater distance per cubic foot of air consumed.

There are many other advantages too — write for bulletins.

EIMCO AN28

THE EIMCO CORPORATION

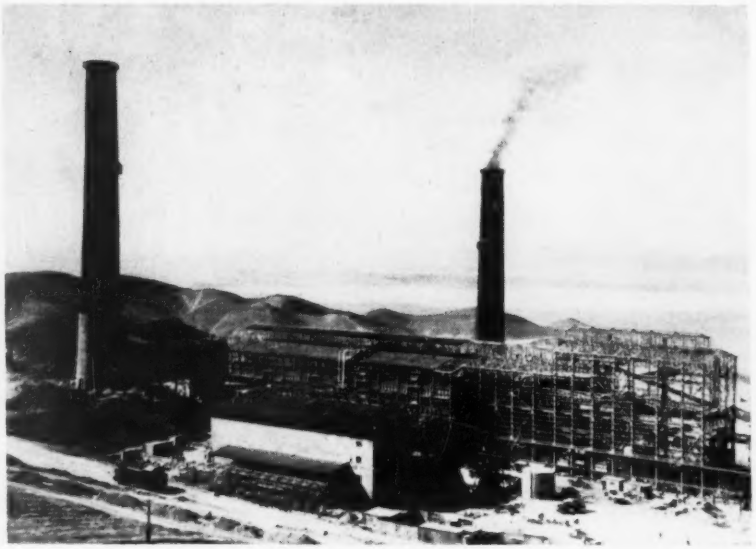
The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

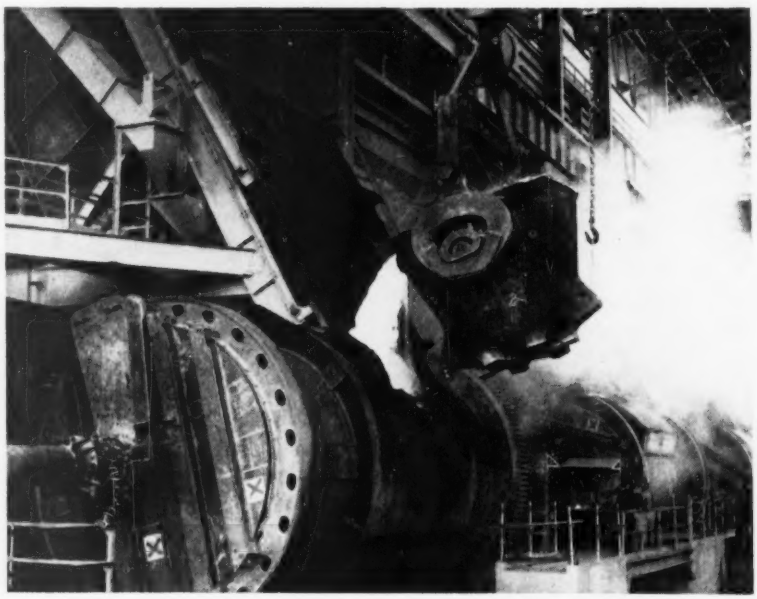
BRANCH SALES AND SERVICE OFFICES

NEW YORK 51 32 SOUTH STREET • CHICAGO 33 N SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 617 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 11, ENGLAND
IN ITALY: EIMCO ITALIA S.P.A., MILAN, ITALY



Chuquicamata's New Copper Smelter —Its Blister Output Is Coming in Now



BLISTER COPPER from Chile Exploration Co.'s Chuquicamata (Chile) smelter (above) is now being electrolytically refined at International Smelting & Refining Co.'s Raritan Copper Works, Perth Amboy, N. J. Building since 1948, its first output was obtained Nov. 5 and first shipment docked here Dec. 2.

The new plant produces blister from sulphide ores rather than oxide ores, which heretofore accounted for all Chuquicamata blister. Chuquicamata's open-pit operation will be continued while the company goes underground for sulphide ores. Combined output of the oxide and sulphide plants is expected to reach 0.5-billion lb. a year.

BELOW, matte from the new plant's reverberatory furnaces is being poured into the converter. (The plant's matte contains about 43% copper, blister about 99%.)

Chile Exploration and International Smelting & Refining are subsidiaries of Anaconda Copper Mining Co.

Israel To Mine Half-Million Tons Copper Ore A Year

Abraham Dor

KING SOLOMON'S MINES will yield 0.5-million tons of copper ore a year over a three-year period beginning in mid-1953, Abraham Dor, chief engineer of Israel Mining Industries, said at a recent press conference in New York.

He said Israel Mining Industries, a government company, will mine 100,000 tons by next July in order to assay more precisely the 18 to 20-million-ton probable reserve. Extensive exploration and sampling indicate the ore will average between 1.4 and 2.4% copper.

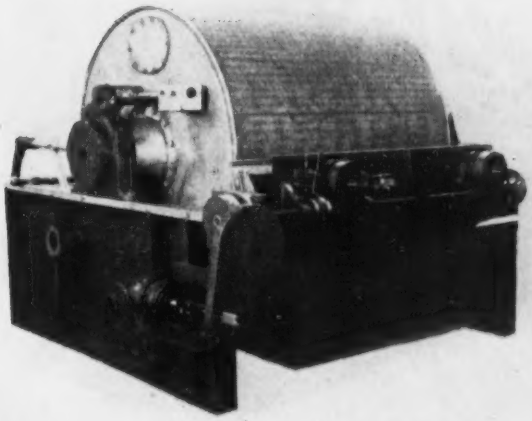
Possible reserve was put at between 40 and 45-million tons. Core drillings over a large area at intervals of about 50 yd. have proved from 4 to 5-million tons. Enough appears as outcrops or beneath little overburden to permit all mining planned for the next 3½ years to be carried out as an open-pit operation, for which Israel's mining personnel are well trained. (Lack of training is one reason given for postponing for the present any underground work, which is planned for the future.)

"Our problem today is not whether to produce copper," said Dor, "but how much it is feasible to produce."

He told how Biblical references to the mine guided prospectors to the ancient site in the southern region of the Negev Desert, about 15 mi. north of Eylat, where they found artifacts bearing out the Bible story.

Dor described the deposit as geologically unique. "It is a bedded sedimentary ore that is fully oxidized," he said, "constituted mostly of chrysocolla (copper silicates) accompanied in some places by phosphates of copper. There is no gold or silver whatever."

Filters for Metallurgical Industries



Eimco's experience in solving difficult and unusual filtration problems can be helpful to you.

Many complex ores require the cooperation of producer and manufacturer to provide the proper equipment for maximum results. Eimco offers its laboratory services to aid in determining the filterability of any slurry.

Old processes as well as new can benefit by the numerous new innovations being developed by Eimco specialists in vacuum filtration.

Eimco manufactures all types of filters. Our aim is to help you select the best type of equipment for your particular application.

EIMCO

THE EIMCO CORPORATION

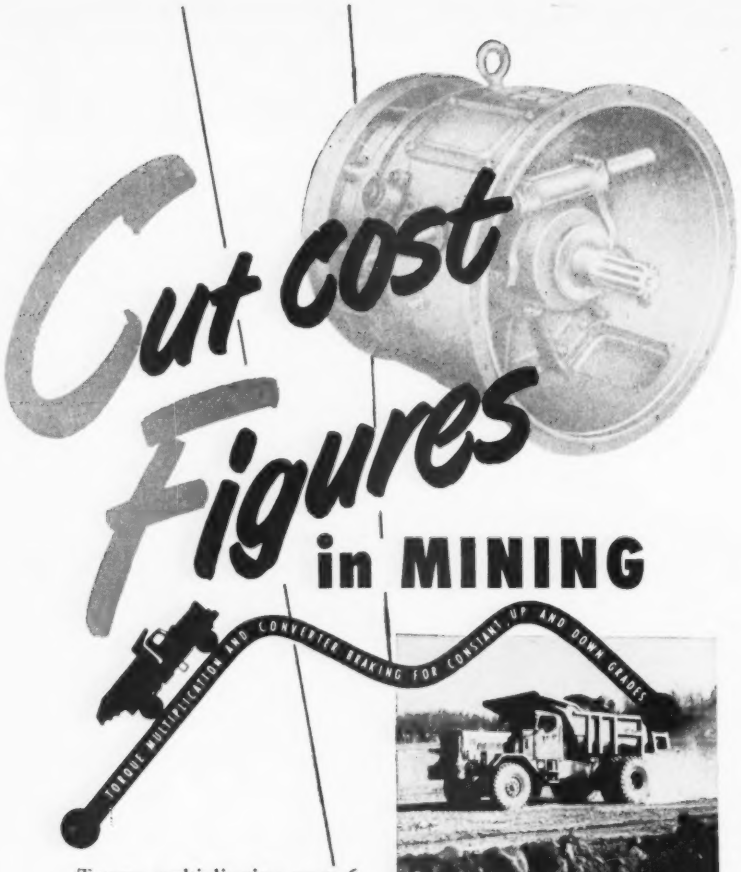
The World's Leading Manufacturer of Vacuum Filtration Equipment

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY



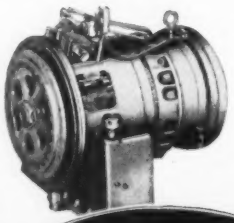
Torque multiplication up-to-6 times—combined with smooth, powerful, *automatic* torque converter braking—are making these Dart Model 140 Trucks stand out in hauling performance and operating economy at the Pickands-Mather Company's West Hill Mine at Coleraine, Minnesota.

The power of their 300 hp Cummins NHRS Diesel engines is delivered through Twin Disc Model CF Torque Converters—providing smooth uninterrupted acceleration on steep pulls—as power transmitted *stays in balance* with load demands. Operators control their trucks both on the steep up-grade and downhill runs with the accelerator—seldom have to shift gears, or touch the brake pedal.

In heavy-duty off-highway trucking applications, Twin Disc Model CF Torque Converters are contributing to bigger payloads handled faster . . . and sharply reduced equipment maintenance costs.

Get the full story on Twin Disc Torque Converters for all on-and-off-highway trucking applications. Write for Bulletin 501.

Twin Disc offers two truck type torque converters —Model CF (top) with *automatic* torque multiplication and downhill braking for foot-pedal control on short, steep, up-and-down hauls—and Model DF (below) with *selective* operation on all functions—downhill braking, uphill pulling, and Direct Drive for the straightaways.



Built for a Long Life . . .
Backed for a Lifetime

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin · HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

This Month in Mining *(Continued)*

He said the flowsheet is being finalized to make use if possible of thermal smelting methods but that, should current trials prove unsatisfactory, the process would entail leaching with sulphuric acid followed by electrolysis. In answer to a question whether the paucity of (high-grade) coal in Israel wouldn't prohibit smelting in Israel, Dor said oil and low-grade coal would be used.

Technical consultants of Compagnie Belgo-Continentale, a private Belgian concern, are assisting.

Overall Program

Israel's policy with respect to the entire expansion program for metals and minerals production, said Dor, is to undertake exploration to the point where feasibility of operations is established, then wherever possible to turn over development to private capital (largely U. S.).

Mr. Dor is in this country for a nation-wide speaking tour to assist his country in raising $0.5-billion through a State of Israel bond issue. Much of these funds would be appropriated for the metals and minerals program, which is further helped financially by TCA funds. Bureau of Mines' Foreign Minerals Division gives technical assistance.

Earth-moving equipment is for the most part to be purchased in the U. S. Most other equipment will be bought here and in Europe.

Exploration

"Exploration," Dor stated, "will continue to be pushed vigorously. Systematic study of the Negev has been carried on for only about two years, so that prospects for substantial new discoveries are still very great."

He described the outlook for other metals and minerals as follows:

Iron

There are two promising deposits in the northern and central Negev. The first, a sandy limonite, the more thoroughly explored of the two, assayed 30 to 35% iron, but very high silica content was indicated. However, only the recent discovery of the second and far more promising deposit accounts for present inactivity at the first site. Exploration is still in the early stages at the new site, which assays between 55 and 65% iron with a dolomitic gangue.

Manganese

A sedimentary deposit about 20 mi. north of Eylat in the southern Negev, partly diffuse and partly concretionary, constitutes a probable reserve of 2-million tons of ore assaying 45 to 50% MnO_2. Mr. Dor's company is conducting trials for beneficiating the ore in order to remove small fractions of copper and phosphorus. The ore is mostly pyrolusite containing relatively little iron.

THE ENGINEER'S REPORT

DATA

PRODUCT Chevron Starting Fluid

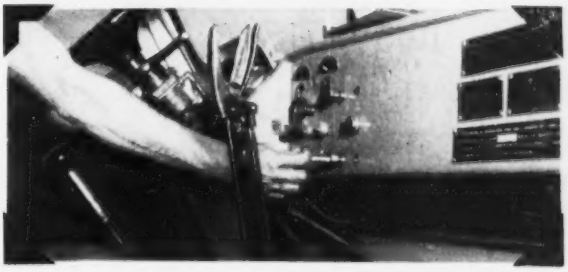
UNITS Diesel engines

CONDITIONS Sub-zero temperatures

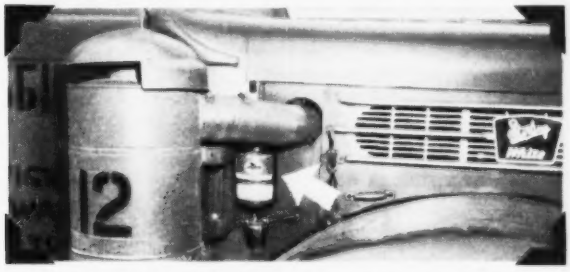
EQUIPMENT Permanent dash-mounted primers—bulk storage tanks

FIRM Picco Logging Co., Montesano, Wash.

Diesels start instantly at 20° below zero!

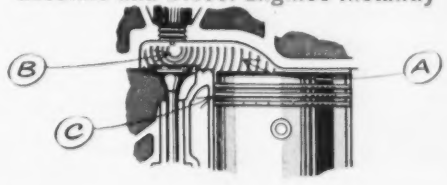


PRIMED WITH CHEVRON STARTING FLUID, diesel engines in Picco Logging Co. trucks "start instantly, even in winter temperatures that sometimes reach 15° and 20° below zero," according to E. W. Picco, owner. Previously, the company lost from 10 minutes to an hour a day in starting each truck. And often, when left out overnight, trucks had to be towed before they would start. The dash-mounted pump shown above is worked once or twice as the engine turns over, forcing fluid through atomizers into manifold.



MOUNTED NEAR THE ENGINE, this storage tank holds bulk Chevron Starting Fluid. It is also available in 7- and 17-CC gelatin capsules. These capsules are placed in a puncturing tool, and fluid is pumped into intake manifold the same way as from the central bulk tank shown. Each type of dispensing equipment is suitable for both diesel and gasoline engine and is available from your starting fluid supplier. Chevron Starting Fluid is approved by leading engine manufacturers.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides powerful, easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear, and ice formation in primer equipment.

HOT NEWS — COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

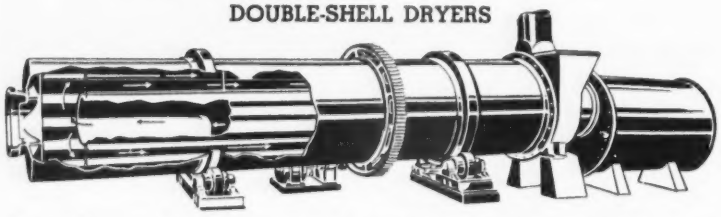
STANDARD OIL COMPANY OF CALIFORNIA • San Francisco 20
THE CALIFORNIA OIL COMPANY • Barber, New Jersey
STANDARD OIL COMPANY OF TEXAS • El Paso
THE CALIFORNIA COMPANY • Denver 1, Colorado

IS DRYING YOUR PROBLEM?

RUGGLES-COLES DRYERS

Hardinge makes six distinct types of Ruggles-Coles double and single shell Rotary Dryers, designed for direct, indirect and steam heat. Modifications of these standard types are also made to take care of peculiar drying problems which cannot be handled by standard equipment. Write for Bulletin 16-D-1.

DOUBLE-SHELL DRYERS



The "XA" Dryer (above) is a double-shell semi-direct heat dryer of high efficiency for materials that can be dried in direct contact with combustion gases and heated above 212° F.

Type "XB" is a similar, double-shell unit with complete separation of material and combustion gases.

SINGLE-SHELL DRYERS

The Ruggles-Coles "XF" is a single-shell dryer (using counterflow) for drying materials at temperatures above 212° F. A number of other variations are available.

ROTARY KILNS

For continuous calcining, roasting or oxidizing. Retractable firing hood. Available in sizes from 3' to 9' diameter—30' to 90' long.

ROTARY COOLERS

For cooling hot materials after high temperature drying or calcination. Available in three types: air cooled, water spray cooled, and semi-submerged. From 3' to 10' in diameter, shell lengths to suit.

HARDINGE

This Month in Mining *(Continued)*

Magnesium

Dead Sea water contains billions of tons of magnesium chloride, but development cannot be undertaken until Israel is able to provide abundant low-cost electric power.

Potash

Production is being resumed from the billions of tons of potassium chloride in the Dead Sea. It will amount to 130,000 to 150,000 tons a year in the immediate future, ultimately about 300,000 tons a year. The potash exists in solution, needs only to be pumped out and precipitated.

Phosphates

A very extensive deposit in the northern Negev exists in the dry state beneath little overburden and within 100 mi. of a harbor, facilitating development for export. First phase of exploration is completed, but further exploration will be undertaken in an effort to prove already indicated probable reserve of between 100 and 150-million tons. Development and exploitation are under way. A plant is being built to produce in the near future from 100,000 to 150,000 tons a year of upgraded rock, most of it to cover Israel's needs. In preparation are plans to produce 1-million tons a year for export. As mined, the rock would assay about 50% bone phosphate of lime, and beneficiation would upgrade it to 74% bpl for export.

Glass Sand

The country will soon produce between 35,000 and 40,000 tons a year for domestic consumption.

Ceramic Clays

From 15,000 to 20,000 tons a year will be produced for domestic use.

Bromine

Production by precipitation with chlorine from Dead Sea brines will be started soon on a minor scale.

Gold Subsidies Grow —In Size and Number

SUBSIDIES FOR GOLD MINES the world around are growing in size and number. Though **Southern Rhodesia's** gold miners had to struggle through 1952 without governmental aid—or fold up—the new year came in with a promise of early relief. Minister of Mines G. A. Davenport said plans now in preparation would establish subsidies in the current year. Amount of help will be determined on the basis of balance sheets of small and low-grade operations submitted to the Mining Affairs Board. A form of relief proposed by the Rhodesian Mining Federation Congress is to free premium gold sales of taxes. (Number of Rhodesian producers dropped from 792 to 476 between 1943 and 1951.)

Recent revision of the Emergency Gold Mining Assistance Act is liberal enough to bring forth predictions nearly all Canada's gold mines will sell exclusively in Ottawa to take advantage of the benefits, operators who sell to the world market being ineligible. Possibly only one major Canadian mine—Kerr-Addison—will remain in the world market. Operators were given until Jan. 30 to decide. (The new formula provides subsidies equal to half the cost of production in excess of a standard production cost now fixed at $18 an oz. and limits subsidies to $13.50 an oz. Cost to the Dominion Government in 1953 is estimated at $15-million, from $3.5 to $4-million more than in 1952 and equal to about 10% of estimated worth of production in 1953. The previous formula fixed standard production cost at $22 an oz. and limited subsidies to $11.50 an oz.)

In Colombia, where output dived from 45,590 oz. last January to 28,944 in September, a premium of (U.S.) $12 an oz. (equal to 30 Colombian dollars) has just been instituted. One predicted result is receipt of about $7-million for gold exports in 1953.

In response to a 60% decline in her colonial output since 1939 and the current likelihood that her chief domestic producer, Mines de Salsigne, will cease to operate unless given relief, France is on the verge of extending to gold producers the same fiscal privileges given export industries. Such a program, it's estimated, would cost the French Government £250,000 a year. French domestic production in the past two years approximated the 60,000-oz.-a-year level of pre-war years, but Mines de Salsigne's directors said they were taking heavy losses since the Paris free market price dropped from 550,000 to 500,000 francs per kg. bar.

Volta Project Site

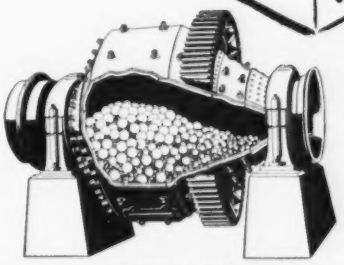
HERE (See map on page 142) £144-million will be spent to develop rich bauxite deposits at Mpreaso and Yenahin and build an aluminum smelter at Kpong having ultimate capacity of 210,000 tons a year, a 564,000-kw. hydroelectric plant at Ajena, and extensive rail and port facilities. Tema will serve as port.

In general, Aluminum Limited of Canada and British Aluminum Co., Ltd., will manage mines and smelter, the power plant will be built and managed by the British and Gold Coast Governments, and the Gold Coast Government will finance the public works. The companies must offer at least 75% of smelter output of the first 30 years' operation to British users at a price not to exceed the prevailing lowest f.o.b. price of ingot or pig in the U. S. or Canada.

First phase would require from five to seven years' development, cost £100-million at current prices, and provide plant capacity for 80,000-ton-a-year output. The second phase would cost an additional £10-million, up capacity to 120,000 tons. Ultimate

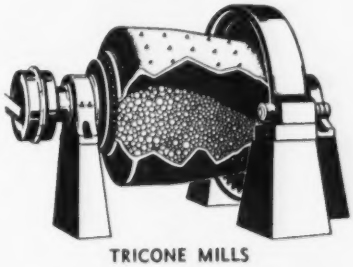
IS GRINDING YOUR PROBLEM?

HARDINGE MILLS



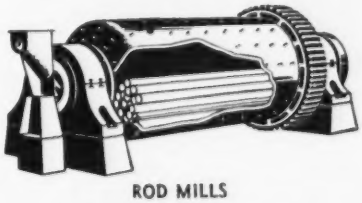
CONICAL MILLS

CONICAL MILLS — The Hardinge Conical Ball (or Pebble) Mill is unequalled in efficiency. Grinds wet or dry, is open or closed circuit. Outstanding feature: natural size segregation of grinding media, from feed to discharge. Bulletin 17-B-1 for dry grinding; Bulletin AH-389-1 for wet grinding.



TRICONE MILLS

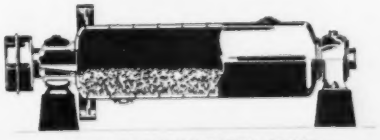
TRICONE MILLS — Same ball segregation effect as obtained in the Conical Mill, plus additional grinding volume. Ideal for large capacity operations. Bulletin AH-414-1.



ROD MILLS

ROD MILLS — Ideal for producing minimum oversize in open circuit grinding. Grinds either wet or dry. Convex heads reduce friction, prevent congestion of charge at the ends, and align the rods. Bulletin 25-B-1.

TUBE MILLS — For a fine product in open circuit without the use of classifiers. For mixing and grinding to secure a smooth texture of plastic product. Bulletin 18-B-1.



TUBE & CYLINDRICAL MILLS

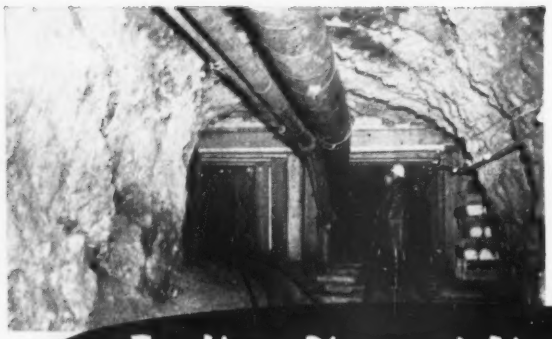
CYLINDRICAL MILLS — The Cylindrical Ball (or Pebble) Mills have demountable trunnions, and convex heads to reduce head liner wear and increase mixing action. Supplied with or without grates, as required. Bulletin AH-389-1.

HARDINGE COMPANY, INCORPORATED

YORK, PENNSYLVANIA—240 Arch St. Main Office and Works

NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1

122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.



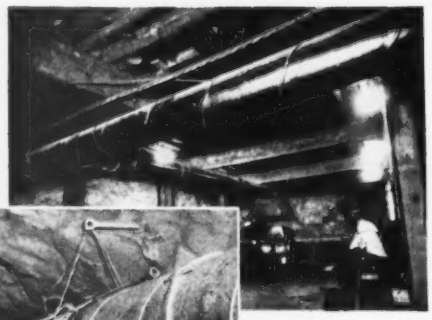
For Vent Pipe and Air Lines...

GET THE FACTS ON

NAYLOR

Lightweight

PIPE

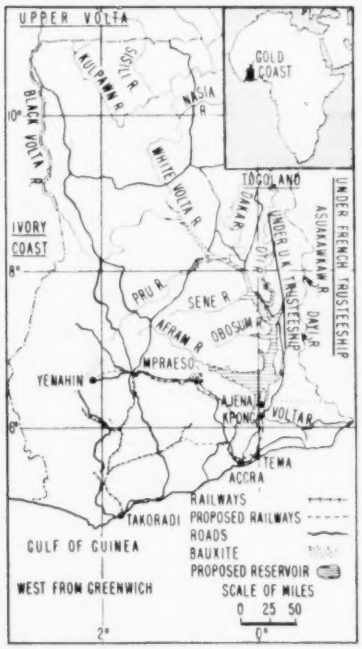


Naylor is the one lightweight pipe with the built-in strength and safety required for push-pull ventilating as well as pressure air lines in mining service. It's easy to handle and install, especially with Naylor's Wedge-Lock coupling. It's extra strong because the Naylor Lockseam Spiralweld structure provides a distinctive reinforcing truss which adds collapse strength necessary for push-pull service. Naylor pipe comes in sizes from 4 to 30 inches in diameter.

For full details, write for Bulletins No. 507, No. 513, and No. 514.

NAYLOR PIPE

NAYLOR PIPE COMPANY
1243 East 92nd Street, Chicago 19, Illinois
New York Office: 350 Madison Avenue, New York 17, New York



capacity is to be attained within 20 years.

Total reserve is estimated at 200-million tons of bauxite.

The hydroelectric scheme (estimated cost £54-million) is to dam the Volta at Ajena to raise it 260 ft. above sea level, creating a lake 2,000 sq. mi. in area. Records of the river's flow, available through the past 20 years, indicate the flow at the dam could be controlled to limit spillage to 35.70 cu. ft. per second and loss of head to a 25-ft. maximum. (Power resources were surveyed by Sir William Halcrow & Partners, London consulting engineers who are also investigating Kariba Gorge on Rhodesia's Zambezi River.) All but 50,000-kw. reserved for other Gold Coast users will be available for operation of the smelter.

Almost half the £26-million earmarked by the Gold Coast Government for public works development will go into building the new port, work on which is now under way.

The companies are anxious to stimulate a private capital market as a hedge against nationalization under a colonial government that is rapidly approaching dominion status.

IN THE U. S.

ALABAMA

★Woodward Iron Co., Bessemer, has been issued a DPA certificate for expenditure of $315,000 for development of iron ore in a projected expansion program.

ARIZONA

★**U. S. Manganese Corp.** has purchased the Associated Mining Co. mill at Aguila west of Wickenburg. The plant has a capacity of 200 tons of copper ore daily and includes an assay laboratory. It is adjacent to the corporation's manganese mill, in operation two years. The copper plant will handle low-grade ore from corporation properties in the vicinity.

★Tiger operations of **St. Anthony Mining and Development Co.** were to be discontinued because of declining metal markets and ore depletion. About 100 workers were affected.

CALIFORNIA

★**West America Tungsten Corp.** has acquired the Cole & Swift tungsten placer washing plant at Atolia and has overhauled and rebuilt the plant for treatment of gold and tungsten placer gravel from company properties.

West American Tungsten has leases on **Blackhawk Tungsten Mining Corp.** claims located next to the Union No. 1 shaft of Surcease Mining Co. containing about 1-million cu. yd. of workable placer gravel. Leases are also held on the Stevens property north of Union No. 1 shaft and the Good Luck No. 1 and No. 2 claims, leased from Surcease. Washing plant capacity is expected to approach 50 tons per hour with 70% recovery of scheelite and gold.

★**Rubicon Mining Co.** has built an access trail to its tungsten property 11 mi. west of Lake Tahoe, diamond-drilled a part of the extensive mineral zone, and planned construction of a concentrator with a 100-ton-a-day capacity.

Operators expect that cost of mine development and equipment will exceed $250,000. One zone, about 3 mi. wide, was reported to assay about 8% tungsten, other samples ranging from 2 to 20% tungsten.

COLORADO

★The Ward lease on the Ten-to-One shaft of the **Passiflora** property near Westcliffe is being put in condition for mining, and the gasoline hoist is to be replaced by an electric one. An assay shows a value of over ½ oz. in gold and high value in lead and silver. The company is installing a double-drum hoist on the Vidler shaft and has started erection of a shaft house.

★James P. Webb and Melvin Gaymon, doing surface work on the **Pittsburgh placer** in Illinois Gulch, have uncovered a vein with high values in zinc. More than 1 ft. is high-grade galena.

★U. S. Senator Ed C. Johnson of Colorado is hopeful that Colorado

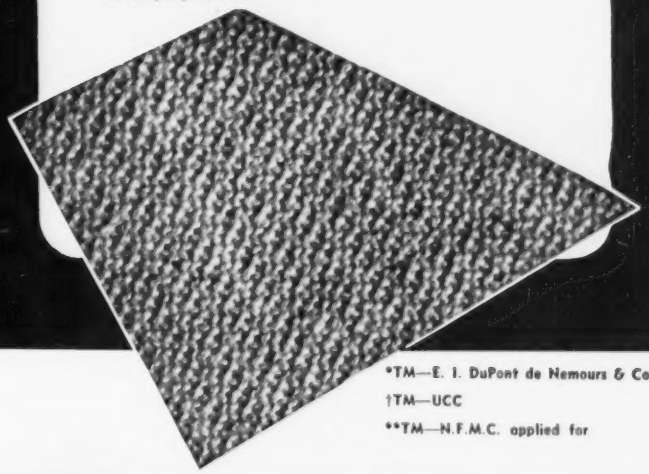
COTTON
Filter Cloths

An Efficient Variety of Weaves and Weights designed by Filter Cloth Specialists

We are specialists in woven filter media for industrial filtration both in media design and application. This specialization goes back almost to the beginning of this century when our organization was founded and has been continuously maintained ever since.

While the advantages of synthetic filter media are outstanding and are fully reflected by our wide range of filter media woven from Nylon, Orlon*, Vinyon N†, Saran, Glass, Vincel** and Dynel, there are nevertheless some filtration operations where cotton filter media still have their place.

In order to properly service such operations, we maintain an adequate variety of cotton filter media in numerous different weaves and weights. Without obligation we will be glad to submit recommendations to you if you will describe your operating conditions to us. As our products comprise all types of woven industrial filter media both natural and synthetic, our selection is certain to be unprejudiced.



*TM—E. I. DuPont de Nemours & Co. Inc.
†TM—UCC
**TM—N.F.M.C. applied for

Weavers of Industrial Filter Media for over Forty Years

NFM The National Filter Media Corp.

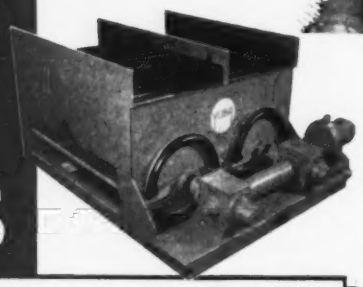
General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill. 2627 West 19th St.
Cincinnati, Ohio Roselawn Center Bldg.
Houston, Texas 1406 Second National Bank Bldg.
Oslo, Norway Nicolai Friis
Johannesburg, South Africa Edward L. Bateman

YUBA Jigs on Biggs No. 3.
Note compact arrangement.

INCREASE ORE RECOVERIES



with YUBA JIGS

Developed for Mill Circuits and Placer Dredges

You can trap many ores and mill products with the YUBA Jigs that have proved so successful in the placer gold dredging industry.

Jig action can be closely controlled by reason of the wide range of stroke adjustments and pulsation frequency.

This flexibility makes possible the capture of finer particles and creates greater capacity and efficiency.

SAVE TIME, POWER, SPACE

YUBA Jigs are built to reduce labor costs and downtime. Operating features include:

Interchangeable drives for pulsators completely enclosed and splash lubricated.
Stainless steel stationary hutch valve.
Simplified stroke adjustment (¼" min., 3" max.).
Maximum frequency—400 at ¼" stroke.
Rubber seal between screen grids and basket.
Low power consumption—as low as 2 hp. for 4-cell unit.
Stainless steel screens—no rust, constant full openings.
Surface action evenly distributed over full area of basket.

Install YUBA Jigs in mills and dredges (new or old) to supplement existing equipment or to replace other recovery methods. They require minimum space and headroom; fit in most dredges without hull changes. Built in multiples of 2 or more cells as needed.

For information about adapting YUBA Jigs to your operation, send data on ore, feed sizes and present installation. No obligation.

YUBA MANUFACTURING CO.

Room 706, 351 California St., San Francisco 4, California, U. S. A.

AGENTS { BIMS, DARBY & CO., LTD. • SINGAPORE, KUALA LUMPUR, PENANG.
SHAW DARBY & CO., LTD., 14 & 19 LEADENHALL ST., LONDON, E. C. 3.

CABLES: YUBAMAN, SAN FRANCISCO • SHAWDARBCO, LONDON

Colorado *(Continued)*

miners will ultimately have the same protection afforded farmers. The **Metals Credit Corp.** he advocates would be built on the same lines as the Commodity Credit Corp. The federal government would buy strategic metals (and the Senator stressed they would be domestic metals only), store them until needed by industry or war, and place a floor under metal prices.

★At Cripple Creek, the first diamond-drill station has been cut in the Chicago tunnel by **Globe Hill Mining Co.**, reports Al Konselman, of Colorado Springs, president. As soon as bits arrive, drilling will start.

★At Rico, due to the drop in prices of lead and zinc, **the Knickerbocker mines** had to close down.

★**Newmont Exploration Co.** has six diamond drills in operation at Leadville. Three drills are being used in Iowa Gulch, and two are in use in Big Evans Gulch, east of the town. Several holes have been drilled to 1000-ft. depth. Newmont also completed extensive diamond-drilling at Gunnison.

★**Barkley Mining Co.** is sinking a shaft near Uravan in search of uranium. The shaft has been sunk 70 of the 260 ft., deemed deep enough to cut known orebodies. More than 55 ft. has been timbered. Two shifts working in the shaft are averaging 3 ft. per shift.

★At Gunnison, R. E. Simpson has announced the temporary discontinuance of **Slate River Mining Co.'s** operation near Crested Butte because of the unfavorable metal market.

★At Breckenridge **on the Pittsburgh placer** claim, operators have discovered lead and zinc ore while doing surface work. The vein will be stripped with a dragline. The ore will be hand-sorted as it is stripped. The fines will be screened off and run through sluice boxes to recover lead. Meanwhile, other veins in the area will be uncovered by bulldozer and stripped by dragline.

★The Mary Murphy mine near St. Elmo and Antero mine at Bonanze have just been closed. These mines were operated by S. E. and Walter Burleson under lease. The Burlesons attributed closing to high cost of production and low metal prices. Both the Mary Murphy and Antero mines are lead and zinc producers.

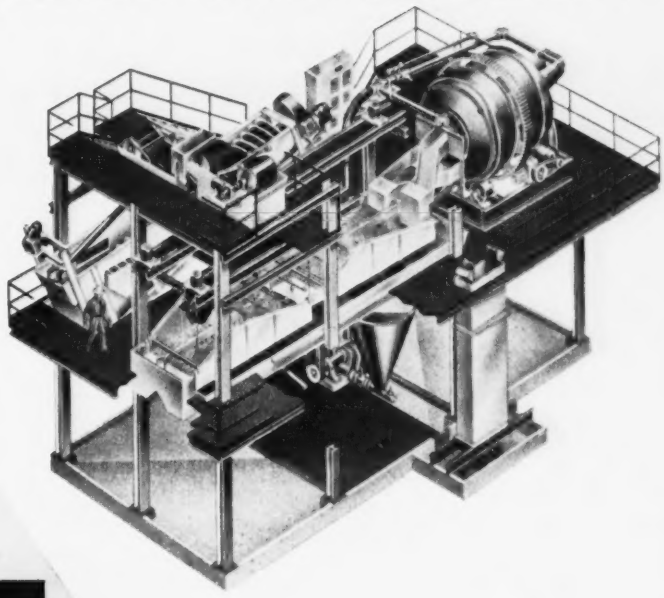
★**Colorado Mining Association** has set Feb. 12, 13, and 14, as dates for its convention. By then the new Congress will have been convened and committee assignments been completed.

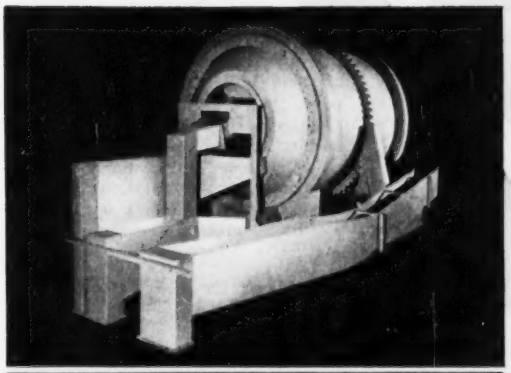
★**Leadville Lead Corp.** is starting diamond-drill exploration at its Dauntless tunnel in Park County. Exploration, aided by a U. S. loan, has been in porphyry to date.

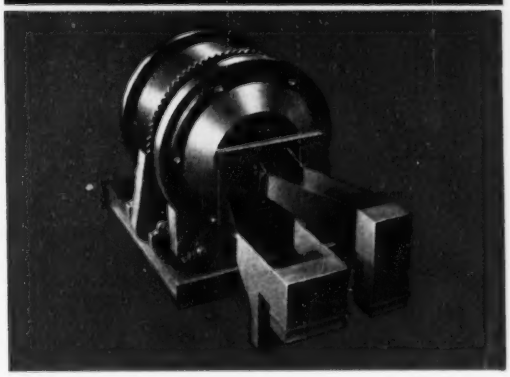
PRECISION CONTROL MEANS BETTER METALLURGY!

The WEMCO MOBIL-MILL gives you precise control of separating conditions with ores amenable to HMS.

WEMCO design allows accurate control of media density and positive sink removal—assures higher grade concentrate and lower tailings.







VERSATILE PERFORMANCE BOOSTS OPERATING PROFITS!

WEMCO MOBIL-MILLS give you **three** types of separators to choose from—fits the equipment to your problem for optimum operating efficiency:

1. **WEMCO** Double Drum Separator gives two stage separation in a single unit for treating ores having a middling component.
2. **WEMCO** Single Drum Separator gives positive sink removal and efficient control of media density for one stage separation over a wide range of size fractions.
3. **WEMCO** Cone Separator gives efficient, low cost separation on ores where a finer range of feed sizes requires greater volume of medium.

PREFABRICATION SPEEDS INSTALLATION, SIMPLIFIES OPERATION!

WEMCO MOBIL-MILLS are **prefabricated,** complete processing units manufactured to precise standards according to field-proven design. Mobil-Mills are quickly and easily installed by **your** mechanics or a **WEMCO** crew, are simple to operate and require a minimum of attendance.

7 MOBIL-MILL ADVANTAGES

- *Prefabrication*
- *Low initial cost*
- *Clean, sharp separation*
- *Fast installation*
- *Compact design*
- *Low operating cost*
- *Capacities 5 to 275 TPH*

Write today for descriptive bulletin and information on how a Mobil-Mill can improve your beneficiation problem.

WEMCO

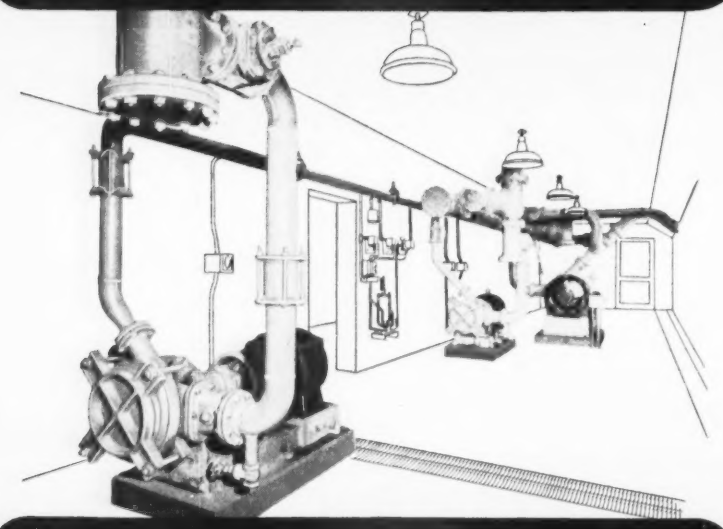
WESTERN MACHINERY COMPANY

760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

OTHER **WEMCO** PRODUCTS

Mobil-Mills · Coal Spirals · HMS Thickeners · HMS Pumps · Sand Pumps Cone Separators · Drum Separators · Fagergren Laboratory Units · Agitators Fagergren & Steffensen Flotation Machines · Hydroseparators · S-H Classifiers HMS Laboratory Units · Dewatering Spirals · Thickeners · Conditioners · Densifiers

Handles extremely thick slurries with high specific gravities



MORRIS Type R SLURRY PUMP

Heavy viscous slurries with solids ratios as high as 70% by volume are not unusual loads for a Morris Type R Slurry Pump.

A case in point is this Morris installation at the Missouri Portland Cement Co., St. Louis, Mo. The two Morris 3R Pumps in the foreground each handle 200 GPM of a cement slurry at 64% solids with 1.66 specific gravity. Speed is 1180 RPM. The 6R Pump in the background handles 600 GPM of the same slurry at 880 RPM.

Long operating life... little or no maintenance

Massive running parts of the Type R compensate for the increased load imposed by high specific gravities. Hydraulic passages are deliberately designed for high concentrations of solids—the result of careful study of wear patterns shown by pumps in the field handling all kinds of abrasive materials. Elimination of areas of throttling and turbulence assures uniform wear of all parts.

There are no internal studs or bolts—no troublesome internal joints and fits. The suction disc liner is merely *clamped* into position between disc and shell. The absence of high stress on the shell permits wide variations in its composition—including materials of high abrasive resistance—to resist wear and extend the operating life of the pump.

Let our engineers consult with you on your slurry pump problems. They'll give you the benefit of 88 years of pump-building experience. Or, write for Bulletin 181.

MORRIS MACHINE WORKS
Baldwinsville, New York
Sales Offices in Principal Cities

MORRIS *Centrifugal Pumps*

FLORIDA

★**National Lead Co.** has purchased additional land southeast of Jacksonville, Fla., to protract life of mining operations by **Humphreys Gold Corp.** Jay P. Wood, general manager of Humphreys, said the present mining area will be depleted in about 10 years and the new area will provide mineral sands for many years to come. The sands yield ilmenite, rutile, zircon, and other minerals.

IDAHO

★In an effort to reduce mining costs, **Clayton Silver Mines** has instituted a system of long-hole drilling at its property in the Bayhorse district of Custer County. Remaining reserves in the stopes above the 400 level are being drilled to a depth of 40 to 50 ft. Each blast brings down about 2000 tons of ore. Formerly, short rounds 5 to 6 ft. deep were drilled and the ore blasted down in small amounts.

Other cost savings are expected through use of new haulageways in the hard ground in the walls off the orebody. This will make possible the mining of pillars which had to be left in stoping from drifts and will eliminate the need for maintenance of timbered drifts and ore chutes. The new mining methods will be used on the new 550 level when it is opened this winter. Shaft-sinking has been largely completed, but a sump and station remain to be cut.

★Production in the Coeur d'Alenes is expected to drop considerably as a result of the power shortage in the Pacific Northwest. A 10% cut in power consumption imposed in mid-November hit the mining industry particularly hard because the reduction had to be based on the comparable period of last year when, owing to a shortage of labor, mine operations in the district were on a considerably smaller scale than in the recent past. The reduction, therefore, will be more than 10% when compared with recent consumption. In addition, the mines have a constant power requirement for pumping, ventilation, and other essential maintenance that cannot be reduced without closing the mines, so the across-the-board cut must be applied almost entirely to productive and developmental work. This means, in some cases, cuts of as much as 50% in consumption for actual production.

All district operations have instituted rigid economy measures in an effort to maintain production at the best possible rate and avoid laying off men or reducing the work week to five days.

Only **Sullivan Mining Co.'s** electrolytic zinc plant was forced to lay off employees—about 60 or 70 men. Its output has been reduced about 25% because its "interruptible" power supply was cut off and the 10% slash meant an additional cutback.

Generally, economy measures have involved adjustment of milling schedules, cuts in compressed-air output, suspension and limitation of development work, and, as a final resort, reduction of mine output.

★A new lower tunnel at **Sun Valley Lead-Silver Mines'** Blue Kitten property in the Warm Springs district of Blaine County has opened into a full face of new ore. The ore is of substantially better grade than was found on the upper level, directly above, and is wider than the present drift face. Production is being stockpiled for milling at a later date.

★A new footwall vein of high-grade silver ore is now being opened by **Polaris Mining Co.** on the 3000-ft. level of the Silver Summit mine in the silver belt of the Coeur d'Alenes. It lies 70 ft. north of the main west drift and was first disclosed by diamond-drilling. A north crosscut from the main drift has opened the structure, exposing a 4-ft. width of silver-copper ore, and development work to determine extent of the orebody is in progress.

ILLINOIS

★Decline in the zinc and lead market has resulted in curtailment of operations at the Hutson mine, **Alcoa Mining Co.'s** zinc and fluorspar orebody in the Kentucky district, southeast of Salem. Operation was reduced from six to five days a week.

★**Alcoa Mining Co.** is completing installation of a new steam boiler at its Rosiclare property. Power plant capacity will be doubled.

★**Minerva Oil Co.**, fluorspar division, recently completed a new 420-ft. haulage drift from the east orebody at its Minerva No. 1 mine to a 300-ton shaft storage pocket. It will be equipped with a 30-in. conveyor belt to eliminate largely the need for locomotive haulage.

★Management of fluorspar exploration and production is transferred from **Aluminum Ore Co.** personnel to personnel of **Alcoa Mining Co.** Walter S. Skeels is works manager of Alcoa's fluorspar property, in the Illinois-Kentucky mining district.

MICHIGAN

★The Sherwood mine of **Inland Steel Co.** at Mineral Hills has gone back to a five-day work week after having been producing six days per week for many months. Ninety-seven employees are affected.

★An interim Michigan legislative committee met at Crystal Falls to hear arguments on a proposed bill which would set up registration and regulation of mineral rights. The meeting was attended by about 40 people representing individuals, mining com-

This drill is **always** on the job

Which drill?

. . . The COPCO Rock Drill, the one that's backed up by the best service organization in the field and the best stocked shelves in the business.

COPCO believes your mine is too important to stand idle. That's why we've built up a big stock of parts and steels; it's why we send them air express when you need them in a hurry. And that's also why we have field representatives making regular calls on every important mining area in the west.

COPCO Rock Drilling Equipment is the "Swedish Gear" that started the trend to fast, light weight, one man rock drills. COPCO is the light weight equipment that's been in western mines the longest. It's perfected and it's backed up by service. If you want rock drilling equipment you can count on — BUY COPCO.

COPCO

COPCO PACIFIC, LTD.
930 Brittan Ave., San Carlos, Calif.

COPCO EASTERN, LTD.
151 Linwood Ave., Paterson, N. J.

BRANCH OFFICES AND WAREHOUSES AT SPOKANE · SALT LAKE CITY
DENVER · PHOENIX · JOPLIN MISSOURI · IRONWOOD MICHIGAN

Michigan *(Continued)*

panies, and the state. Objections to the bill as now written outnumbered approvals. Most mining company representatives seem uninterested, stating that they have had no serious trouble in finding owners of mineral rights and negotiating with them. The legislative committee was to report its findings to a larger group in Lansing.

★**Escanaba,** the Menominee Range iron-ore shipping port, was leading **Marquette** and **Ashland** — shipping points for the Marquette and Gogebic Ranges—in tonnage handled for the 1952 season. Latest available figures indicated **Escanaba** had shipped 4,670,947 tons; Marquette, 3,422,720 tons, and Ashland, 2,452,039 tons. A considerable tonnage of Gogebic Range ore has gone to Escanaba in the last two seasons because of the saving in time gained in the lake haul.

★The Plymouth mine, only open pit on the Gogebic Range, has been closed after 37 years of operation. It was being worked by **Pickands, Mather & Co.** In 1951, the mine shipped 223,027 tons. E. C. Sponberg has been superintendent at the mine for some years.

★Delivery of 19 water pumps to **Calumet & Hecla's flooded Osceola mine** is under way and scheduled for completion next May. Several are of special design. Four, known as incline submersible pumps, are of a type never before built and are specially adapted to the Osceola problem. Designed to operate effectively in an inclined or vertical position, they develop a 350-ft. head and 450 hp., have 3,000-gpm capacity.

The Osceola lode will be unwatered at a rate of 9,000 gpm, will require 18 months' drainage. Shaft rehabilitation and installation of surface equipment, which will be carried out concurrently with unwatering, will be completed about two months later. Production is expected to get under way in two years and reach capacity at the beginning of the third year. Annual output, working two shafts, is estimated at 14,250,000 lb. of copper. Reserves above the 6,000-ft. level are sufficient to provide output at this rate for several years. Enough labor will be available by transferring men from two shafts nearing depletion at other Calumet & Hecla operations to maintain daily ore production from the Osceola lode of 3,000 tons.

The Osceola and Conglomerate lodes are interconnected, all Conglomerate workings being below those of the Osceola. Unwatering is to begin in Tamarack No. 5 vertical shaft in the Conglomerate and proceed until water level is below the 28th level of Osceola No. 13 shaft, permitting unhampered rehabilitation of Osceola shafts Nos. 6 and 13 without need of pumps and pipes. By then, incline-type electric submersible pumps will have been installed and ready to unwater the 11th and 24th levels of Osceola No. 6.

YOU CAN CUT YOUR Timbering Costs— 50%

• OSMOSALTS
• OSMOPLASTIC
• M-T-M

. . . are the MINE PROVEN WOOD PRESERVATIVES that can do it!

By using OSMOSE Treated Mine Timbers in all *permanent places* you can cut your annual timbering bill in half. Because OSMOSE Treated Timbers are scientifically treated to resist all decay and wood destroying insects . . . they LAST 3 to 5 TIMES LONGER. You save NOT ONLY timber cost but the labor cost, too!

There are three ways for you to cut your timbering costs in half: (1) We can supply you with Osmosalts, Osmoplastic or M-T-M (Mine Timber Mix), and you can TREAT YOUR OWN TIMBER, (2) We can sell you ALL TYPES of Osmose Treated Mine Timbers direct from one of our mills, or (3) We can custom-treat your timber. Whichever method you select, you get BIG SAVINGS! Write for complete details!

Send for Illustrated Booklet
"Force Down Your Operating Cost" is a 16-page book that shows and tells all about the Osmosalts treatment. Write for it today!

OSMOSE

OSMOSE WOOD PRESERVING CO. OF AMERICA, INC.

TOWER #2, CONTINENTAL OIL BLDG. DENVER, COLORADO

Main Office: 980 ELLICOTT STREET BUFFALO 9, N. Y.

MINNESOTA

★**Oglebay, Norton & Co.,** which has occupied the role of managing agent for **Reserve Mining Co.** in the development of its taconite mining and concentrating operations at Babbitt and Beaver Bay, has announced that it will act only in a consulting capacity in the future. It will continue in close association with **Republic** and **Armco,** co-owners of Reserve.

★Fenimore Iron Mines, Ltd., active in the Ungava-Labrador area, through President H. A. Strain, announces discovery of a large deposit of siderite which can be mined by open-pit methods. Siderite (ferrous carbonate) contains 48.2% iron when pure. No information is presently available as to analysis, but indicated tonnage is very large.

★Erection of the new concentration plant at **Jones & Laughlin's Hill-Annex mine,** near the pit, and dismantling and moving of equipment from the old washing plant, about 2½ mi. away, was rushed as bitter winter

weather approached. A large concrete settling basin, from which water for the new plant will be re-used, is about completed. The plant will consist of concentrator building, surge-ore storage, primary screening and crusher, secondary screening, desliming classifier, tailings-treatment sections. Such good progress has been made that it is hoped to have the plant ready for the 1953 season's opening.

★**Cleveland Cliffs Iron Company's Atkins mine** at Kinney, where stripping was begun just 10 years ago, has shipped 2,312,348 tons since.

★The ore carrier **E. T. Weir,** owned by **National Steel Corp.** and to be operated by **M. A. Hanna Co.,** was launched at the Lorain, Ohio, yards of American Ship Building Co.

★**The Lake Erie price formula** for taxing ore has been getting a public airing lately. A subcommittee of the interim legislative committee set up by the 1951 Legislature adjudged the method "fair and equitable." The Lake Erie price includes the value of the ore at the surface of the mine plus freight and insurance charges to move the ore to Lake Erie ports. The Minnesota state occupation tax on ore is based on this figure. The ad valorem tax is based on the value of ore estimated as remaining in the ground, which is in turn influenced by the average of Lake Erie prices for the last four years.

★**M. A. Hanna Co.'s** winter program calls for moving approximately 22-million cu. yd. of stripping distributed over many of the company's mines. The Enterprise (a new property) will move 2-million yd. of surface; the Douglas, 1.8 million yd.; the South Agnew, 2-million yd. from the Agnew No. 2 extension; the Morton, 1-million yd., including 0.5 million yd. of surface to be stripped in preparation for the dragline stripping program at the South Eddy (about 2½-million tons of ore estimated at this mine); Section 18 mine, 0.5-million yd. of surface and 1.5-million yd. of rock; the Carlz, 0.4-million yd.; the Mississippi group, 0.7-million yd. of surface and 1.2-million yd. rock; the Perry mine, 1.5-million yd. of rock; Cooley group, 2-million yd. of surface and 0.6-million yd. of rock; Buckeye, 750,000 yd. of surface; Cuyuna group, 1,225,000 yd.; the Portsmouth, 265,000 yd. of surface and 350,000 yd. of rock; the Weggum, 300,000 yd. of surface and 350,000 yd. of rock.

In addition, the Enterprise will build a new conveyor system and a new screening plant; the Weggum will relocate its ore conveyor, needed for stripping; the Morton will begin construction of a new washing plant, screening plant, and ore-hoisting system; the Carlz will build a washing plant, screening plant, and tailings pond; the Mesabi Chief crude-ore pocket will be redesigned, and the Harrison will add a cyclone unit to its plant.

MONTANA

★**Madisonian Mining & Milling Co.** (C. A. Lester, of Bozeman, president) is developing chrysotile asbestos on a group of 54 mining claims 10 mi. west of West Yellowstone, Madison County.

Mr. Lester also heads **Interstate Products Co.,** of Bozeman, which is mining and processing an amphibole asbestos deposit south of Bozeman. Interstate is being worked by open-pit methods. The processing plant, which is in Bozeman, turns out raw asbestos fiber.

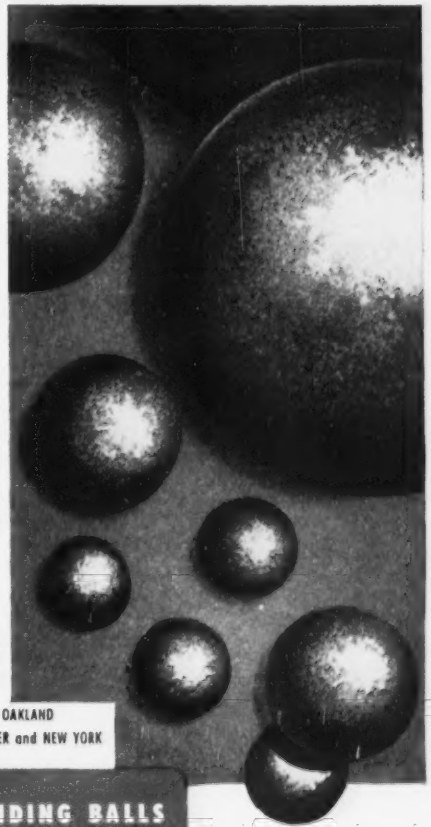
★The date is fixed. **Mining Association of Montana** will hold its 10th biennial legislative meeting in Helena, **January 29.**

★Preparations for open-pit mining of high-grade fluorite deposits in the Sapphire Mts. of Havalli County, east of Darby, were completed by **Cummings-Roberts Engineering Co,** of Compton, Calif., before the property was shut down for the winter early in December. The company plans to mine at least 600 carloads of the rich ore during the operating season next year. Production will be shipped to the Geneva, Utah, plant of U. S. Steel

CF&I STEEL PRODUCTS FOR THE MINING INDUSTRY

FORGED STEEL GRINDING BALLS

Good for the Long Grind



You'll find CF&I Grinding Balls where the going is toughest. They're forged from special analysis steel to give high impact and abrasion resistance ...wear evenly and stay spherical.

If you have any grinding problem, call upon CF&I metallurgists and engineers for assistance...they're always available to help you obtain the most from your grinding media.

CF&I PRODUCTS FOR THE MINING INDUSTRY

Col-Wic Wire Cloth Screens • Grinding Balls • Wickwire Rope • Mine Rails and Accessories • Grinding Rods • Rock Bolts

THE CALIFORNIA WIRE CLOTH CORPORATION • OAKLAND
THE COLORADO FUEL AND IRON CORPORATION • DENVER and NEW YORK

CF&I FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

E. A. GODOY & CO., INC.

CUNARD BUILDING, 25 BROADWAY

NEW YORK 4, N.Y.

CHROME ORES

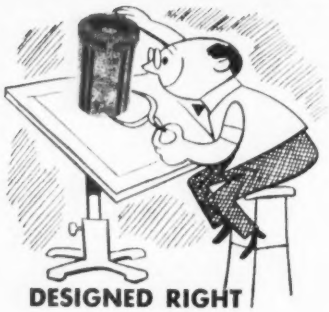
MANGANESE ORES

IRON ORES

CHRISTENSEN

Diamond Products Co.

means...



DESIGNED RIGHT

BUILT RIGHT

ENGINEERING

Each Christensen Diamond Bit is individually engineered and designed to meet your specific drilling requirement.

to WORK RIGHT

WRITE TODAY: for our recently completed Diamond Bit and Core Barrel Catalogs.

NAME .....

ADDRESS .....

CITY .....

STATE .....

LESS COST PER FOOT

CHRISTENSEN

DIAMOND PRODUCTS

1937 SO. 2nd WEST, SALT LAKE CITY, UTAH

Montana *(Continued)*

Co., which has a long-term lease on the property from A. E. Cumley, R. D. Flightner, and Lester Thompson, all of Darby.

The deposits were located in the summer of 1951 and were investigated last fall by a Bureau of Mines field team. According to a recent report, extensive sampling indicated an average grade of 97.2% calcium fluorite and 1.44% silica.

NEVADA

★George W. Mitcheli, general manager of **Eureka Corp., Ltd.**, writes that his company hopes to make a start soon on the unwatering job in its Richmond-Eureka mine. Meantime, he reports, three small-to-medium portable rotary oil well rigs have been on the property for some time drilling prospect holes in an effort to extend the lower ore zone. These holes, he added, would not be used for pumping. (Eureka Corp. was formed by **Ventures, Ltd.**)

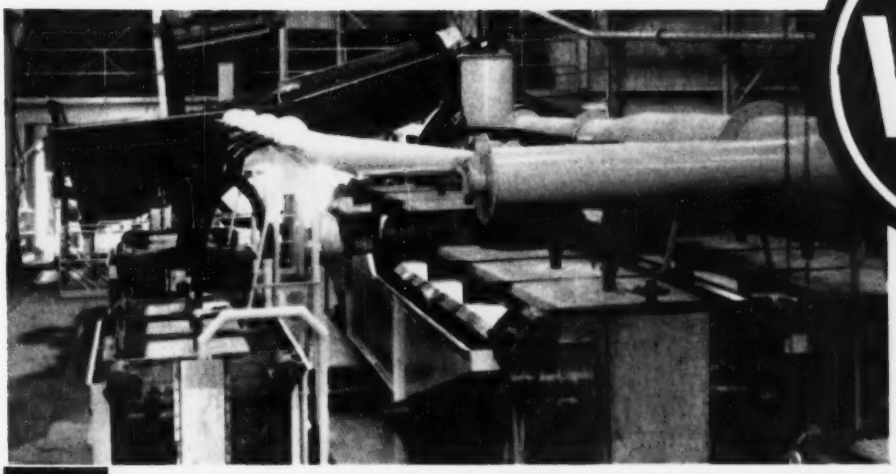
★**Nevada Massachusetts Co.**, of Pershing County, which continues to lead the nation in production of tungsten, is currently operating four mines and milling about 450 tons of scheelite daily. Employing 170 men, the company is developing ore deposits at a depth of more than 1,000 ft. Charles Segerstrom, of Sonora, Calif., is president.

★**The recently-completed tungsten mill in Spring Valley** is showing good results after its first few weeks of operation. Owned and operated by six California men, the mill has a metal bunker and diesel power plant. The mill uses the late-model Dunham economy concentrating tables and a newly built crusher, along with a classifier which the operators say can save 96% of the scheelite. The classifier, patented by Nate Lockhart, a member of the company, is capable of grinding to 100 mesh fineness. At present, 50, 30, and 20-mesh screens are being used. Associated with Lockhart in the operation are Earl Nixon, Curtis Chance, Oliver Ensley, Roger Brumaker, and Al Tannis.

★Immediate construction of a $50,000 mill in Humboldt County is planned by **Arizona Ranchers Supply Co.**, of Glendale, Ariz. The company has purchased 300,000 tons of sulphur ore from **Black Rock Desert Mineral Co.**, of Sulphur, and the mill will be erected there to treat it. The new structure will replace the mill at Sulphur that is presently producing fertilizer sulphur from the Balfour-Guthrie Co., San Francisco. The Arizona firm has leased the present mill and will keep it in operation with a payroll of seven men until the new and larger mill is constructed. Plans call for production of 20,000 tons of sulphur annually and a stockpile of 5,000 tons for immedi-

DESIGNED FOR PRODUCTION EFFIC

WKE



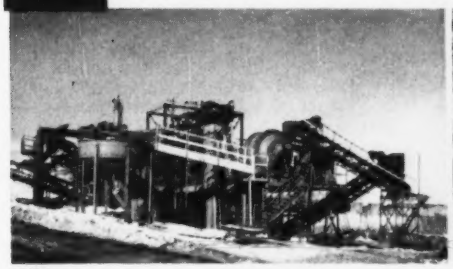
A Unique Attrition and Flotation Plant at Del Monte Properties

This attrition and flotation plant at Pacific Grove, California, is a typical example of the design and engineering skills available at WKE. Faced with special problems in the separation and extraction of beach sands, WKE engineers designed and erected this plant using a new and effective approach. It is now proving its efficiency in turning out 50 TPH of assorted, premium-quality sand products.

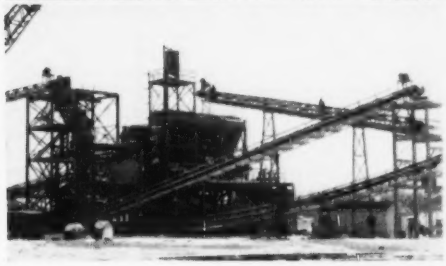
This practical know-how, based on WKE's long experience in mineral dressing, is at your service in the design, engineering and construction of metallic and non-metallic mills.

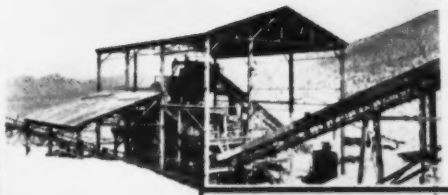
W. S. MOORE CO.
VIRGINIA, MINNESOTA
Completed in 1951, this 150 TPH heavy media iron washing plant includes a WEMCO Mobil-Mill and auxiliary washing facilities. Design and engineering by WKE.

● ***Here Are Other Typical WKE Engineered Plants Recently Placed Into Efficient Production:***



TRIUMPH MINING COMPANY
HAILEY, IDAHO
Designed and constructed by WKE, this lead-zinc selective flotation plant has a capacity of 200 TPH; operation started in 1952.





BASIC REFRACTORIES, INC.
GABBS, NEVADA
Designed and engineered by WKE, this HMS plant processes brucite, turning out 50 TPH. Heart of the installation is a WEMCO Mobil-Mill.

COONS-PACIFIC COMPANY
EVELETH, MINNESOTA
placed this 150 TPH iron washing plant in operation during 1952. Equipment includes a heavy media Mobil-Mill, spiral concentration unit and auxiliary washing equipment. Design and construction by WKE.

If you are contemplating mill design and construction, or expansion of present facilities, write for helpful particulars. No obligation, of course.

W.K.E.

WESTERN KNAPP ENGINEERING CO.
DIVISION OF WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET • SAN FRANCISCO 7 • CALIFORNIA

Nevada *(Continued)*

ate shipment. It is expected that 30 men will be employed when the new mill starts working. A $5,000 warehouse will also be constructed. The Sulphur property, 45 mi. west of Winnemucca, has proven ore amounting to 5-million tons. It includes 1,600 acres, underground development, and six open pits.

★The old gold-mining camp of Candelaria is becoming active again under direction of **American Metals Co.** Mine Manager Carl Earl has six men employed in and above the old workings, at the mouth of Pickhandle Gulch. Work is under way on a deep shaft where most of the early-day ores were mined. Equipment includes a gallows frame, an all-diesel electric power plant housed in a brick building, and an electric hoist and compressor. A 100-ton mill on the west side of Columbus Marsh, about 10 mi. from Candelaria, is handling the ores. Gene Gates is in charge of the mill.

NEW MEXICO

★**Anaconda Copper Co.**, mining uranium at several locations in the state and building a mill to process the ore at Prewitt, has placed a severance tax problem before state revenue officials. Company Attorney E. C. Iden, Albuquerque, posted a $10,000 bond with the state to protect the firm in case the tax must be paid. The U. S. Supreme Court ruled early this year that firms doing business with AEC are exempt from state taxes, Iden pointed out. Apparently every uranium producer is doing business with AEC, the only legal market for uranium ores. To date, only one small operator has paid the tax.

★**Freeport Sulphur Co.** will begin potash mining in the Carlsbad district early in January. The site is about 30 mi. east of the present activities of five companies.

NORTH CAROLINA

★Preparation of **a reconnaissance geological map with a complete inventory of the state's mineral resources** and a state topographical map were proposed for inclusion in North Carolina's immediate program of expansion in the field of minerals development. The proposals are contained in a report issued by Dr. J. L. Stuckey, head of the minerals division of the State Department of Conservation and Development.

He further proposed more detailed geological mapping and study of mineral deposits be undertaken as increasing industrial activity heightens the need for it.

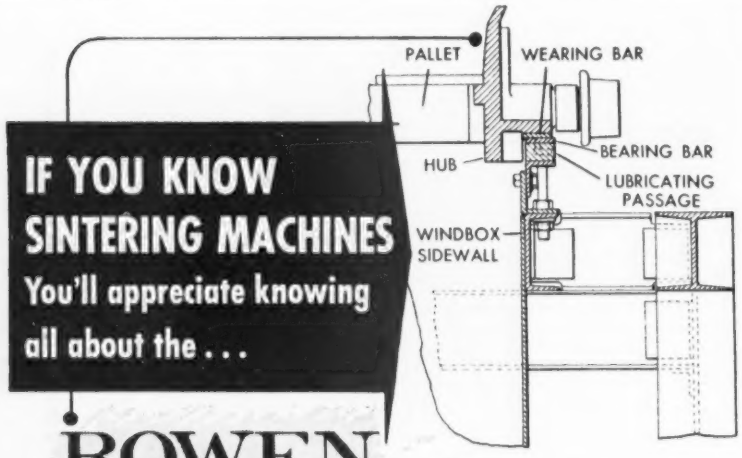
Pointing out that North Carolina, one of the largest cement consumers, did not have a cement-making plant, Dr. Stuckey said he was hopeful studies on marl and limestone would justify construction of such a plant.

Reviewing activities of his office during the past year, he said interest had been shown in particular in sheet mica production in western North Carolina, output of spodumene concentrates at a plant near Kings Mt., and studies of marl deposits in Pender County and nearby. He pointed to the doubling of tungsten ore output at a plant near Henderson as an achievement of nation-wide importance.

★**Carolina Vermiculite Co.** is now completing installation of modern equipment to expand vermiculite ore production at High Point.

OREGON

★A $45-million plant with an annual capacity of 54,000 tons of aluminum is being planned by Harvey Machine Co. at The Dalles, according to L. A. Harvey, vice president. A permit from the DPA has been applied for, and, if approved, construction will start immediately. A year to 18 months would be needed to complete the project.



IF YOU KNOW SINTERING MACHINES
You'll appreciate knowing all about the . . .

ROWEN WINDBOX SEAL*

The Rowen Windbox Seal completely eliminates false air in the windbox due to air leakage between pallets and windbox.

- *Outside Windbox—in full view*
- *Readily Accessible and Fully Adjustable*
- *Positive Pressure Seal—prevents abrasion and wear from fines and hot gases*
- *Automatic Cyclic Lubrication*
- *Replaceable Seal Bearing Surfaces*
- *Installed With or Without Upper Rails*

The Rowen Windbox Seal provides higher production. It lowers air volume requirements. It insures a more uniform product. It makes possible process applications previously impractical or uneconomical, such as those involving gas concentrations.

Now available on new DWIGHT-LLOYD® sintering machines.

Adaptable in many instances to your present sintering machine —regardless of manufacture.

Write for further information

*Reg. U. S. Pat. Off.

METALLURGICAL DIVISION
SINTERING MACHINERY CORPORATION
120 SINTER AVENUE NETCONG, N. J.

★**Oregon counties sharing in federal** timber-sale proceeds in lieu of taxes have lined up behind a move to induce the new Congress to **amend mining patent laws to retain timber on the tracts.**

Association of Oregon Counties, in annual convention in Portland, took the action on report of the forestry and grazing committee. Judge Day T. Bayly, Lane County, reported that in 11 western states, mining claims have been filed on 1,845,000 acres and only 2.6% of the acreage currently represents active mining operations; the U. S. Forest Service considers only 36% of the total acreage to have any mineral value. It was argued by supporters of the mining law amendment that many claims in national forests are filed for timber or recreation purposes.

Oregon has been a storm center on the issue in the last several years. Mining operators have been aware of abuses of the mining claim law and have protested to federal agencies involved in management of forest.

UTAH

★**International Smelting & Refining Co.'s** closing of its Tooele lead-zinc smelter for "three or four months" leaves the Midvale smelter of U. S. Smelting, Refining & Mining Co. Utah's sole major lead-zinc processing plant.

★Some 4,000 members of International Union of Mine, Mill and Smelter Workers employed at Utah properties of **Kennecott Copper Corp.** were signing contracts with the company following upwards of five months of working without contract status.

★University of Utah's *Economic and Business Review* reported statistics to show how much mine production declined with the **drop in lead-zinc prices.** The report put October lead production at 12,064,500 lb. as against a 12,650,100-lb. output in September, a 4.6% drop. October zinc production was 7,545,100 lb. against 8,454,200 lb. for September, a drop of 10.8%. Silver production was 865,500 oz. in October, down 5.8% from September.

However, copper output in October was 47,344,000 lb., up 1.3% from the September figure of 46,724,900.

★With the decline in output expected to become worse unless an unexpected upturn in prices occurs, Miles P. Romney, **Utah Mining Association** manager, and Otto Herres, vice president of **Combined Metals Reduction Co.,** said relief could come only through a "new climate in the national administration under which careful thought could be given to the protection of the domestic industry against inroads of offshore imports."

While there is little in the way of effective relief that could be provided on the state level, Utah legislators are expected to take "a long, hard look" at the hard-rock industry's difficulties when the Legislature convenes Jan. 12. Charles W. Spence (D) long known as a "labor legislator," has promised members of the Democratic minority will go along with GOP legislators in any "reasonable" effort to assist the industry.

WASHINGTON

★**American Zinc, Lead & Smelting Co.,** which operates the Grandview mine in the Metaline district, is substituting diesel-drive air compressors for those powered by electricity in hopes of meeting the 10% power cutback without cutting production or laying off men. Other economies will also be effected, Dale I. Hayes, regional manager, reported.

★A survey in December indicated that the Northwest was holding its own in the power crisis and that, unless the situation grew worse, an additional cutback would not be necessary for a while. It was reported that, if mining operators believed the cutback would mean undue hardship, they could apply for an adjustment of quotas. Some operators had said it might be necessary to cut the work week from six to five days.

New SAMPLING MOIL

- Simple design, spring and ball hold point in place.
- Points may be changed without use of wrenches or other tools.
- No nut to loosen in use or to interfere with angle of cutting.
- Carbide Tipped Points for greater life.

Hayes

HM 524

HAYES STEEL PRODUCTS LIMITED . MERRITTON, ONTARIO

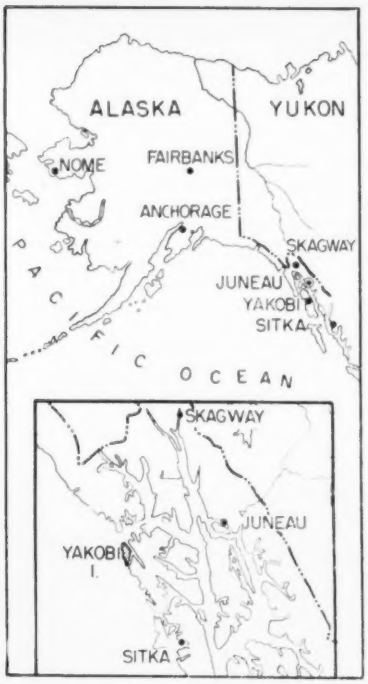
Representatives: G. T. Johnson, 4340 West 8th Avenue, Vancouver 8, B. C.; General Sales & Equipment Limited, 325 Main Street, Winnipeg, Manitoba; George MacLeod, Noranda, Quebec; Construction Equipment Co. Limited, 404 Old Weston Road, Toronto, Ontario; Construction Equipment Co. Limited, 180 Vallee Street, Montreal, Quebec; Construction Equipment Co. Limited, 135 Lower Water Street, Halifax, N. S.; Thomas M. Nevin y Cia, S. A., Av Insurgentes # 40, Mexico 6, D. F.; Western Machinery Company, N. 808 Division Street, Spokane, Washington, U.S.A.; Charter Inc., 115 S. First Street, Ishpeming, Michigan, U.S.A.

IN ALASKA

★**Alaska Chrome Corp.'s** Chrome Queen mine, across Katchemak Bay from Homer and 8 mi. from salt water, is at a standstill because of lack of shipping facilities, it's reported by C. A. Sherman, general manager. Chromite is being imported, Mr. Sherman says, while a vast deposit is dormant in Alaska. This chromite assays 3-to-1 ratio of chromite to iron and could be shipped without processing to steel plants for use in production of stainless steel.

★A deposit of uranium has been found at Brooks Mt. only 65 mi. from Siberia, USGS reported, and traces have been found in several places on Seward Peninsula. It is thought uranium may occur in a lode deposit or vein near the head of Peace River.

★**Goodnews Bay Mining Co.**, which employed about 50 men last season on its platinum operation, reported a successful season. The company brought in a new Bucyrus Erie dragline shovel using a 6-to-7-yd. bucket. It has a 25-ft. boom and can dig to a depth of 65 ft. A new 1,400-hp. plant was installed to operate dredge and shop, together with lighting, heating, and water for camp.



Yakobi Nickel Venture

JOHN ROSS STIRRETT, who writes that he's reliably informed the price of nickel is "about to jump to $1 a lb.," disclosed that a Toronto financial group will selectively mine sulphide nickel deposits in Bohemia Basin on Yakobi Island, Alaska, and produce nickel concentrate at a nearby mill capable of handling 7,500 tons a day. Erastus Miles Flynn is in charge of a party now at the site making preparations.

Stirrett, who is a Toronto barrister and solicitor, referring to the Paley Report's evaluation of the Yakobi deposits, says that "the authors . . . do not know the inside economics of the nickel industry on its sulphide side as well as we do in Canada, and they are in error when they cut off nickeliferous sulphides at a minimum of 0.8% nickel. He said that statements in the Report were based on "the slender evidence" of 15 drill holes . . . "and we happen to have more thorough data. . . ."

A USGS bulletin puts total reserve of sulphide-bearing material on the island at 20.8-million tons indicated and inferred, with average grade 0.33% nickel and 0.21% copper but reports about 35% of the material is barren and if excluded by selective mining would up grade to 0.45% nickel and 0.28% copper. Outcrops appear at 1,300-ft. elevation. A channel 800 ft. deep provides protection for shipping.

"The temperature never goes below 30 deg.—which is remarkable for any mine in Alaska," writes Stirrett. "However, the rainfall amounts to . . . 120 inches per year."

Stirrett said he was not at liberty to name the principals at this time.

This is worth looking into

We make CAST IRON PIPE... built to last for generations... in any size from 2" to 96" with all types of joints. For 97 years, the WF trade mark has meant "Durable Pipe", made with proper crushing, beam, shock and bursting properties.

It's the kind of pipe that stays in service . . . rugged, strong, economical . . . because you can bury it and forget it! Miles upon miles have been underground for almost a century and *still* in good condition when excavated.

BELL & SPIGOT PIPE
SHORT BODY BELL & SPIGOT SPECIALS
FLANGE PIPE • FLEXIBLE JOINT PIPE
CAST IRON ROLLS • CYLINDERS

•

PIPE AND FITTINGS ALSO AVAILABLE IN HEAT RESISTANT AND CORROSIVE RESISTANT MEEHANITE METAL

•

Also manufacturers of jobbing castings through 20 tons in weight in Alloy Iron, Grey Iron and Meehanite Metals.

Specify **WARREN**
CAST IRON PIPE...
AND BE SURE!

Warren FOUNDRY & PIPE CORP.
55 LIBERTY STREET, NEW YORK 5, N. Y.
PLANTS: Phillipsburg, N. J. Everett, Mass.
WARREN PIPE CO. OF MASS. INC. 75 FEDERAL ST. BOSTON, MASS.
97 Years of Continuous Service

IN CANADA

★**Canadian metal-mine dividends** have set another new record in the past year, reaching an all-time top at more than $144.5-million. Records had been set previously in 1951 at $140.6-million, and in 1950 at $118-million. Cumulative total for all mines to the end of 1952 now exceeds $2.3-billion.

The past year's good showing was made possible by the base metal mines. The big ones—International Nickel, Consolidated Smelters, Noranda, and Hudson Bay—all paid the same as in 1951; while good increases were registered by Quemont, Anacon Lead, Reeves MacDonald, Waite Amulet, and several smaller companies. The showing made by gold mines was disappointing, 21 of them paying less than the amounts they distributed in 1951.

A much less prosperous showing for mining dividends must be expected in 1953. There is still no prospect of improvement for gold mining (though the higher cost-aid will do much to offset costs, which are still rising) and there is certain to be a reduction in dividends by many of the base metals. Recent price cuts, especially in lead and zinc, will make that imperative.

ALBERTA

★A 400-mi. rail line to tap mineral, timber, and agricultural resources of northern Alberta and the Northwest Territories is being studied at Edmonton. The line would be an extension of Northern Alberta Railways to the Great Slave Lake area, where **Consolidated Mining & Smelting Co.** owns base metal reserves at Pine Point. Such a line is foreseen as the first unit in an eventual rail system to Alaska for defense purposes. Point of the NAR extension mentioned is Grimshaw.

BRITISH COLUMBIA

★British Columbia mining and Alberta oil industries are linked in a new agreement approved at Vancouver under which **Newmont Mining Corp.**, New York, will develop Pacific Nickel Mines Ltd. property at Choate, near Hope, 100 mi. from Vancouver. Ore produced will go to the new **Sherritt Gordon Mines** refinery being built near Edmonton, Alberta.

Newmont has been exploring the property since last May, using a new geophysical technique.

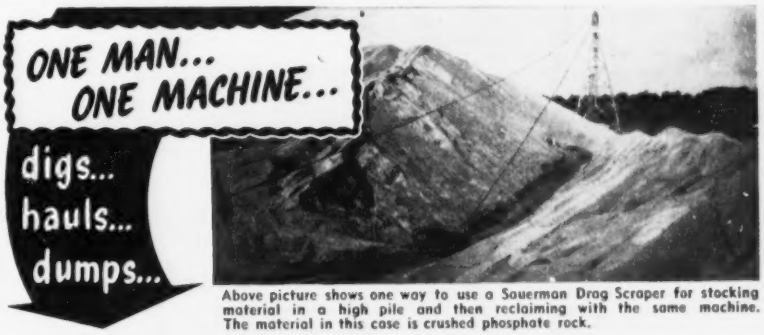
First stage provides for investment of $250,000, with equal participation by the two companies. In the second stage, Newmont would provide an additional $675,000. If sufficient ore were proved for mill construction, Newmont would assist in bringing the property to production, a new company being formed to take over Pacific Nickel.

★**Giant Mascot Mines Ltd.**, a new base metal producer south of Golden, has contracted to sell its entire output of lead concentrates to **Bunker Hill & Sullivan Mining & Concentrating Co.** at Kellogg, Idaho. Giant Mascot hit a new high in October, milling 13,400 tons of ore for recovery of 753 tons of concentrates, a combined result of increasing the mill capacity during the summer to 500 tons daily and improving mining methods.

★**Kootenay Belle Gold Mines, Ltd.**, was suspending mining and milling operations in mid-December, following notification from **Consolidated Mining & Smelting Co.** that the Trail plants would be able to handle only half the lead and zinc concentrates produced by the company's base metal properties as of Dec. 1. About 100 men are affected by shutdown of the Sandon-Richmond-Eureka properties and Whitewater operations at Retallack.

★The Mastodon mine near Revelstoke has temporarily suspended milling operations due to low prices for base metals and curtailment of acceptance of zinc concentrates at the Trail smelter of **Consolidated Mining & Smelting Co.** Mine development is being continued with a reduced crew.

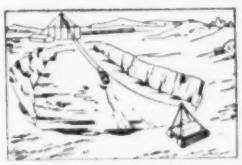
★**Hedley Gordon Gold Mines Ltd.** has acquired a controlling interest in **Canadian American Tungsten Co.**, owner of a tungsten property in Pine Nut mining district in Douglas Coun-



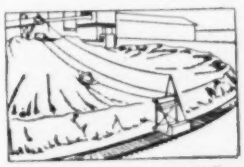
Above picture shows one way to use a Sauerman Drag Scraper for stocking material in a high pile and then reclaiming with the same machine. The material in this case is crushed phosphate rock.

SAUERMAN method...

Simplifies Material Handling!


Sauerman Slackline Cableway

Sauerman Scraper Excavator


Sauerman Scraper Stockpiler

Where materials are to be moved distances of several hundred feet or more, a Sauerman Drag Scraper or Slackline Cableway can cut the cost per cubic yard to a low figure because it is able to dig, haul and place the material in a continuous, straight-line operation, doing away with the expense of rehandling. The operation is smooth and rapid, producing large yardage with moderate expenditure of power.

The first cost of a Sauerman Machine is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator.

Whether your project is large or small, there is a size and type of Sauerman machine suited to your requirements—a machine that will give you years of steady service at minimum expense.

★ *Write us about your interests and we will send illustrated catalogs by return mail.*

Rope Haulage Equipment Specialists Since 1909

SAUERMAN BROS., Inc.

584 S. Clinton St. **Chicago 7, Ill.**

New and Better Diamond Bits
for
Modern High Speed Drilling

Always a leader in its field, Sprague and Henwood, Inc. has been working for a number of years on the development of new types of Diamond Bits, to supplement their well-known "TRUCAST" bits, which are still unsurpassed for many diamond drilling requirements.

NOW, after having been thoroughly proved by Sprague and Henwood's contract drilling crews, under every variety of drilling conditions, these new bits are available to other users. Two new types of "Powdered Metal" matrices; improved "Cast Metal" matrices; "Impregnated" coring bits; a new faster-cutting "Taper" bit for drilling blast holes in very hard rock —are all illustrated, described and tabulated in a new 16-page bulletin, No. 320. Write for it today if you can use it to advantage.

DRILLING MACHINES
and Accessory Equipment

To get the full benefit of our new diamond bits you need drilling machines with plenty of power and a wide range of both speed and feed. Model 40-C is our latest-model core-drilling machine and can be relied upon for best possible all-round results on holes up to 1000 feet in depth. Other modern machines provide for very deep core-drilling and for either core-drilling or blast-hole drilling underground. We also manufacture a complete line of improved accessory equipment. Illustrated bulletins containing detailed information mailed promptly.

CONTRACT DRILLING

We do drilling by contract and are one of the oldest and largest contractors for any type of core drilling. Experienced crews are available at all times for service anywhere in the world. Estimates submitted promptly on request.

SPRAGUE & HENWOOD, Inc. Scranton 2, Pa.

See our four-page insert in the Mining Catalogs

WORLD WIDE ACCEPTABILITY
GREENSBURG storage battery LOCOMOTIVES are the modern "workhorses" of mining and construction industries in many of the far-flung corners of the world. Users from Hawaii to Honduras, from Algiers to Alabama like their strong, simple construction . . . their extremely low upkeep cost . . . their longer battery life! All locomotives are custom-designed to meet your most exacting requirements. For a more efficient storage battery locomotive use Greensburg. Write TODAY!
HAWAIIAN DREDGING CO.
NO.1
2 TON
GREENSBURG PONY
GREENSBURG MACHINE COMPANY
102 STANTON ST., GREENSBURG, PA.

British Columbia *(Continued)*

ty, Nev. Hedley Gordon plans to use part of its income from the Nevada tungsten operation for further development of claims adjoining the Nickel Plate mine of **Kelowna Mines Hedley, Ltd.**, at Hedley. Ore from the Canadian American deposit will be milled at the Dayton mill at Silver City (capacity 10,000 tons monthly) if current negotiations are successful.

★Work has been started on the 46-mi., $14-million branch line of Canadian National Railways from Terrace, on the main CNR line from Prince Rupert to Edmonton, to **Kitimat, site of Aluminium Company of Canada's** smelter. Terrace is 90 mi. east of Prince Rupert. The job may be finished next year, certainly by the time the Alcan smelter is due to go into operation. Two hundred men are clearing the right-of-way from both Terrace and Kitimat. About 12 bridges will be constructed.

★First official talks between the British Columbia Government and **Aluminum Company of America** on Alcoa's proposed $400-million aluminum development near Skagway, Alaska, were held recently at Victoria. No announcement of results has been made. Taking part were Lands and Forests Minister Robert E. Sommers and J. T. Crowdon, Pittsburgh, chief consultant for Alcoa.

★**Western Tungsten Copper Mines, Ltd.** (formerly Western Uranium) plans to boost mill capacity at its Red Rose tungsten mine near Hazelton to 3⅓ times the present 150-ton daily output. Company officials believe sufficient ore is available for 500-ton milling capacity.

★Two Slocan base metal mines have teamed up so one can increase its production by sending ore to the other's mill. **Violamac Mines, Ltd.**, has completed arrangements to ship ore to **Western Exploration Co., Ltd.'s** mill at Silverton. This will enable Violamac to triple production while expanding its own milling rate.

★**E tella Mines, Ltd.**, has turned an operating loss into a profit through drastic economy moves and stepped-up production at its zinc-lead mine near Wasa in the Kootenay area. The company made an operating profit of $19,200 in November, compared with a $31,000 loss in October, and a $30,000 profit was expected in December. Crew was slashed from 138 in October to 59 on Dec. 1, with more cuts to come, and mill rate was raised from an average 148 tons a day for a 5-day week to 175 tons daily for 7 days a week.

MANITOBA

★**Hudson Bay Mining & Smelting Co., Ltd.**, will sink a shaft on its Birch Lake property a few miles southwest of Flin Flon. A diamond-drill program

was carried out continuously through the past year, outlining a copper-zinc orebody of moderate width. The company held over 200 claims, staked or under option, at last report.

NOVA SCOTIA

★**Gay River Lead Mines,** diamond-drilling on property 35 mi. northeast of Halifax, has turned up a large tonnage of low-grade lead-zinc ore, the best section showing 430,000 tons with average grade 3% combined metals. Work was suspended because of low metal prices, and plans for the immediate future were still uncertain.

ONTARIO

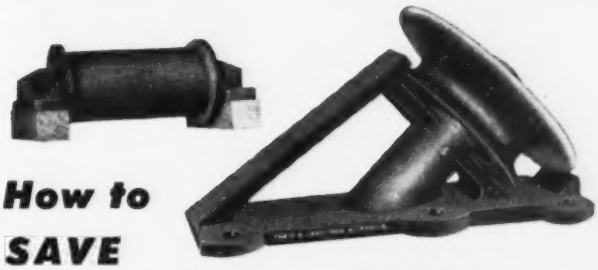
★**Noranda Mines** is acting on its long mooted plan to produce elemental sulphur, sulphur dioxide, and high-grade iron sinter from the big sulphide zone of its Horne mine. Jointly with **North American Cyanamid, Ltd.,** Noranda will construct a $4-million plant at Welland, Ont., to treat ore taken there by rail. North American will take all sulphur dioxide production to replace imported sulphur used in sulphuric acid output.

QUEBEC

★The 250-ton mill of **Weedon Pyrite and Copper Corp.,** 39 mi. northeast of Sherbrooke in the Eastern Townships, started production with an ore reserve of 425,000 tons averaging 2.2% copper, 27% sulphur, and 1.4% zinc.

★Shareholders of **Macdonald Mines** have approved an agreement with **Noranda Mines** whereby the present production lease is to be cancelled and a new company formed to take over 940 acres of Macdonald's ground, MacDonald receiving a 49% interest. Noranda will advance $3.5-million for construction of a 1,500-ton mill and assume responsibility for mining and production. It is expected that construction will start during the coming spring. The ground, a zinc-pyrite-copper prospect, is in Dufresnoy Twp. a short distance from Noranda.

★The base-metal price decline has caught up with **Pershcourt Goldfields,** and work has been suspended at its zinc-silver prospect in Barraute Twp. adjoining Barvue Mines. Markets have not been favorable to the raising of new capital. Surface drilling indicated 6.7-million tons of low-grade zinc-silver ore, including 2.8-million tons averaging 3.45% zinc and 3.28 oz. silver. A shaft had been sunk to 500 ft. and extensive lateral work done on the 450-ft. level with results corroborative of indicated tonnage and grade; but large amounts of money were still needed, and further work awaits return of more favorable conditions.



How to SAVE on Your ROPE HAULAGE

Sheaves and rollers definitely affect mine haulage costs. Wearing surfaces must be adequately hardened, with interiors and strength members carefully heat treated for toughness. *Card* sheaves and rollers are made under the same high quality control as *Card* car wheels—first choice for hundreds of cost conscious mines.

C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO

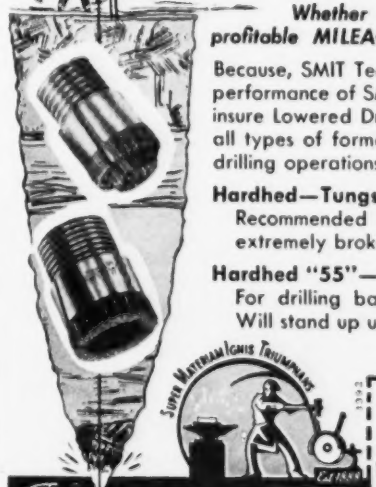
Low cost MILEAGE with SMIT Diamond Bits and Reaming Shells

Whether you're seeking economical footage or profitable MILEAGE, SMIT Bits will help you get both.

Because, SMIT Technical Staff continually tests design AND performance of SMIT Diamond Drilling Tools in field trials to insure Lowered Drilling Costs and High Salvage Returns on all types of formations which may be encountered in your drilling operations.

Hardhed—Tungsten Alloy Matrix
Recommended for drilling all types of ground except extremely broken or abrasive formations.

Hardhed "55"—Tungsten Carbide Matrix
For drilling badly broken, highly abrasive formations. Will stand up under most difficult conditions.



Clip the Coupon for details

J. K. SMIT & SONS, INC.
Murray Hill, N. J.

Please send catalog and performance specifications to:

NAME.....
COMPANY.....
CITY.....STATE.....

Pictured, Skookum 208-SH Slusher Block. Like the big reptile, this block is perfectly at home in water, muck or dust because it was designed to its environment.

DESIGNED FOR THE ENVIRONMENT.

ALLIGATOR AND SKOOKUM SLUSHER BLOCK

Muck and water in mines pose no problem for Skookum Slusher Blocks, because they are *designed for efficient operation in the mine environment.* For example: bearings are permanently sealed against moisture, muck and dust. Extra broad throats pass knots and splices. Tough? A Skookum block operated 15 years without failure in a Western mine.

WE BUILD TO YOUR SPECIFICATIONS

SKOOKUM CO., INC.

8504 NORTH CRAWFORD STREET, PORTLAND 3, OREGON

Quebec *(Continued)*

★Production of Lamaque Gold Mines has climbed to an all-time high following completion of mill expansion. This Bourlamaque gold producer, controlled by **Teck-Hughes Gold Mines,** has upped mill capacity by 500 tons and is now treating 2,000 tons daily. The increase has enabled the company to offset rising costs. As a result, profits in the first eight months were just about the same as in 1951, at 25¢ per share.

★Sigma, too, is in a comfortable operating position. Deepening of the shaft has been completed to a point where eight new levels can be established below the present bottom level (the 16th) at 1,975 ft. The 24th level will be at the 3,150-ft. horizon.

YUKON

★Light and power are now being supplied to lead-zinc and silver mines by a newly opened 2,250-kw. hydroelectric power plant near Mayo Landing, 215 mi. north of Whitehorse.

Power is being delivered to the settlements of Mayo Landing, Galena, and Keno Hill. Previously, electricity came from costly diesel generating plants at the mines. Homes used mostly oil lamps for light.

The new plant, which can be expanded to 4,500-kw. capacity is operated by Northwest Territories Power Commission. It provides adequate power for development and production of **United Keno Hill Mines, Ltd.** Water is delivered from a head of 120 ft. A 6900-v., 6-mi. transmission line carries power to Mayo Landing consumers, while Galena and Keno Hill mining district is served by a 69,000-v. line, 33 mi. in length.

IN LATIN AMERICA

ARGENTINA

★In its program to encourage expansion of the nation's mining enterprises, the government has **exempted the industry from sales taxes.** The measure follows closely the fixing of the price of lead contained in concentrates containing at least 60% at 5 pesos per kg., an inducement which makes lead mining — even for small producers operating far from smelters—attractive.

★**Tungsten output,** still far short of previous records, is gradually increasing. Several operators now are reconditioning concentrating and mine equipment. Reactivated are Concarán, Mina Josefina in Mendoza, the district of Arrequintin in San Juan, and Cerro Aspero in Córdoba.

★The government **plans to push exploration and encouragement of development** vigorously in the next five years, taking advantage of more modern techniques of exploration and installing custom plants in locations where they might induce increased production from small operations.

★Difficulties of importing machinery for the concentrator and mining equipment have further delayed **National Lead's** development of the Castaño Viejo lead-zinc mine. The mine is expected to augment the nation's annual output (now 20,000 tons) by about 6,000 tons.

BRAZIL

★The government of the state of Espírito Santo has recommended construction of a **silo classifier to handle 11,000 tons of iron ore.** Estimated cost of (U. S.) $1.8-million would be borne by Cia. Vale do Rio Doce. The silo would be incorporated later with assets of the port of Victória.

★**A 40% ad valorem import duty on lead** — now under discussion of the Federal Chamber's Economics Committee—will probably be proposed for consideration of the National Economic Council and the Ministry of Finance before anything is done about it one way or another. Proponents say the paucity of domestic production (6,000 of the 15,000 tons consumed here an-

THE CROSSROADS OF SOCIAL AND SHOPPING FACILITIES

On your trip to New York

Easy Access to best shopping in New York's smartest hotel. French cuisine, excellent wine cellar.

The SHERRY NETHERLAND

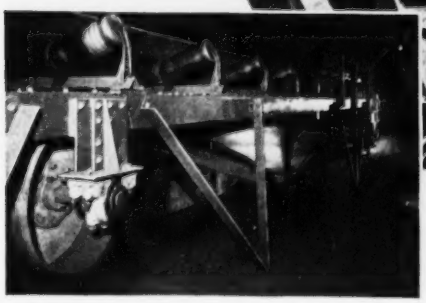
FIFTH AVE. AT 59th ST., NEW YORK

Serge Obolensky, President

How does U. S. Rubber's twisted belt handle wet ore?

BELT BEING TWISTED as it leaves vertical gravity take-up before running over return idlers.

(right) GENERAL VIEW of belt carrying iron ore from crushers to stock pile. (Mather Mine, "B" Shaft of the Negaunee Mine Co., operated by the Cleveland Cliffs Iron Co., at Negaunee, Mich.)



RETURN STRAND of belt being twisted before reaching tail pulleys.

PRODUCT OF U.S. RUBBER SERVING THROUGH SCIENCE

This belt is twisted behind the head pulley to make the clean side of the belt run against the return idlers, preventing wet iron ore from building up on them. The belt is twisted again before it reaches the tail pulley, so that the load is placed on the carrying side of the belt. Installed at a mine in Michigan's Upper Peninsula, this U. S. Matchless belt is 1425 feet long, 36 inches wide. It is used to stockpile ore above ground.

United States Rubber Company engineers have the research facilities and the experience that enable them to build the right kind of belt for your needs. They are specialists in reducing haulage costs and raising output. Write to address below.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Smelting on Site

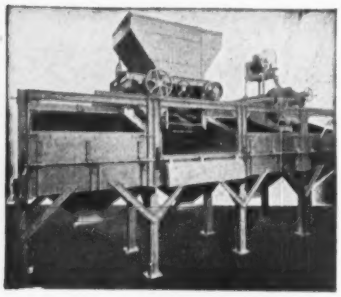
with

MACE Furnaces

and

Sintering Hearths

Saves high transportation and treatment charges on your ores and concentrates.



Wire or write for new catalog.

Standard sizes 5 to 250 tons capacity. Working scale tests on ton lots or larger made at our Denver Smelter. Send us an analysis for preliminary report.

The Mace Company

FIRE CONCENTRATION METALLURGISTS

2763 BLAKE STREET, DENVER 5, COLO., U.S.A.

For FLOTATION +

For effective flotation work,

G. N. S. No. 5 PINE OIL

is recognized as the *standard* frothing oil.

In addition, we produce a complete line of naval stores including special resinates and terpene chemicals.

NEWPORT INDUSTRIES, INC.

230 PARK AVENUE, NEW YORK 17, N. Y.

Brazil *(Continued)*

nually) is due not to inadequate ore reserves but to the fact, they say, that imported lead can be sold for less than 5 cruzeiros, domestic for not less than 13.

CHILE

★The director of the Association of Sulfur Producers said on return from the International Conference on Raw Materials in Washington that the **world sulphur deficit** would be about 1.7-million tons in the current year.

Chilean natural sulphur can be marketed profitably in competition with by-product sulphur in the current price range between (U. S.) $60 and $150 per ton. A two-year study made recently in England indicated Chile has one of the world's most important volcanic sulphur reserves.

But sulphur-surplus nations outside the U. S. complain a severe economic strain is put upon them by the fact import nations buy exclusively from the U. S. in the early months of the year (getting 75% of total import in this way and at prices other producers can't match) and reserve to the latter part of the year all purchases from other export countries. This, they argue, leaves the other export countries completely at the mercy of the import countries.

★Latest available figures on copper production indicate it's running at the same rate (30,000 metric tons a month) as it did throughout 1951 on the average, but blister copper from Chuquicamata's new smelter (see page 136) is expected to swell the 1952 total to substantially more than that for the year previous. The mines now employ 11,500 men. (To November's end Central Bank of Chile had sold 190,000 tons at 35.5¢ per lb. f.o.b. Chilean ports—95% of it to the U. S.)

MEXICO

★The country is banking on undiminishing exports to the U. S. to buoy production of non-ferrous industrial metals.

"Although it is probable that decreased lead and zinc prices will continue," says a statement issued jointly by **Nacional Financiera** and the **Bank of Mexico**, "the necessity—more and more urgent—for the U. S., our best customer, to import non-ferrous industrial metals can maintain quotations at a fair level—even after the Korean emergency is ended."

The statement, based on a survey designed to weigh the industry's attractiveness to foreign capital, lists ore depletion, transportation deficiencies, and reluctance of investors as "heavy impediments" to production, points to a long-term downward trend in development of new resources and

AMERICAN FORGE
GRINDING BALLS

Heat treated
Chrome-Moly
or
Carbon Steel
¾" to 5"

Try AFCO balls. See for yourself how they grind longer and more efficiently, how they reduce grinding ball consumption. Write, wire or phone NOW for prices.

"AFCO"
AMERICAN
FORGE CO.

Executive offices and plant: Niles, Calif.
Phone Niles 3311
Sales offices:
101 Park Ave., New York City
Portland, Oregon
Los Angeles, Calif.
Salt Lake City, Utah
6

Mexico *(Continued)*

ventures on the part of big capital interests in exploiting marginal ores. It concludes that there's little hope exploitation of precious metals will again be profitable to long-range operators but predicts output of gold and silver won't fall off appreciably as long as production of industrial metals holds at current levels.

★**Negociacion Minera de Azufre,** Cerritos and San Rafael, San Luis Potosi, said new equipment being installed to ease the supply problem presages sulphur production at a rate of 2,000 tons a month by the coming spring. Negociacion informed the Ministry of National Economy that its geologists reported reserves amount to 3-million tons averaging 27.5 to 33.3% sulphur.

★**Petroleos Mexicanos** reported current rate of sulphur production at its plant in the Poza Rica oil fields is 140 tons a day. None of it is being exported at this time.

★Sagging metals and minerals prices are posing a problem which "can have very serious results for Mexican economy," said a statement recently issued by the department of economic studies, **Bank of Mexico.** It pointed out that metals and minerals constitute the nation's chief export, about 30% of all this class of trade. Releasing figures representing the value in millions of pesos of production in the fiscal year ended last Aug. 31, the Bank comments that "a mere glance . . . easily gives an idea of the enormous losses Mexico is suffering . . ." The figures:

Antimony	49.4	Iron	29.9
Arsenic	12.7	Lead	755.6
Bismuth	12	Mercury	16
Cadium	41.2	Silver	411.8
Copper	301	Tin	6
Gold	119.5	Tungsten	14.7
Graphite	12.1	Zinc	696.7

★The Ministry of National Economy —quoting 33.4 and 28.6% **declines in output of gold and silver,** repectively, in the five-year period 1947-52, as compared to output in the five years previous—expressed concern lest deposits were nearing depletion. The Ministry reported many deposits of both metals were approaching exhaustion—particularly in the states of Chihuahua, Mexico, Michoacan, and Zacatecas.

★Squeezed between dropping prices and soaring costs, **Cia. Minera La Esmeralda,** Queretaro, stripped its staff of 600 to 200 and reduced operations to the work of a skeleton crew of specialists employed in the foundry. Reportedly, the company absorbed losses amounting last year until mid-November to 2-million pesos.

★Mining men—in management and labor alike— were counting on **President Adolfo Ruiz Cortines,** whose six-year term began Dec. 1, to give the industry a shot in the arm. Particularly sought were tax relief and improved rail transport.

BIN STUCK
LATELY?

"All these cars have to be emptied FAST?"
"It's no problem, mister, just use a CLEVELAND Vibrator. Loosen them up in a matter of seconds."
CLEVELAND
VIBRATOR

Literature on request.

THE CLEVELAND VIBRATOR COMPANY
2034 Clinton Ave. • Cleveland 13, Ohio

1½-Ton Type-J Trammer

South African Representative
Universal Mechanisation Co. (Pty.) Ltd.
Johannesburg, South Africa

Sold in Canada by
Mine Equipment Co. at Kirkland Lake, Ont.

International Agencies & Machinery Co. Ltd. at Vancouver, B. C.

You Benefit ALL WAYS with

ATLAS

TRAMMING LOCOMOTIVES

- MOST SIMPLE IN DESIGN
- COST LESS TO BUILD
- COST LESS TO OPERATE

Operators using Atlas trammers find that their economy is matched by dependable day-in day-out service. Why not let us explain the advantages of Atlas trammers in your operations.

WRITE TODAY FOR COMPLETE INFORMATION

THE ATLAS CAR & MFG. CO.

ENGINEERS MANUFACTURERS

1140 IVANHOE RD. CLEVELAND 10, OHIO, U. S. A.

Filter Cloths

AND

Filter Blankets

made to your pattern and specification to fit your filtering equipment

COTTON

NYLON

ORLON

VINYON

DYNEL

CHEMSTRAND

Let us quote on your requirements

FILTER FABRICS, INC.

704 MARION BUILDING

CLEVELAND 13, OHIO

IN ASIA

JAPAN

★**Alabama-California Gold Mines,** Seattle, Wash., having recently acquired control of the Gando copper-lead mines, of Honshu, Japan, has begun shipment of ore concentrate to Seattle. The Gando mines are considered among the richest in Japan, with seven levels containing about 20-million tons of developed ore.

The company also has taken over the Merry Glue Tungsten Mine in Idaho, David Pryde, president of Hoquiam, Wash., said.

Dowa Mining Co. inspected the Gando mines for Alabama-California.

NEW GUINEA

★**Bulolo Gold Dredging, Ltd.,** subsidiary of **Placer Development, Ltd.,** of Vancouver, B.C., reports for the year ended May 31 gold and silver recovered amounted to $2,816,199 (U. S.). Yards handled totalled 11,458,120, yielding 79,637 oz. fine gold and 33,603 oz. silver. Gravel reserves are set at 80,531,000 cu. yd., 68 million cu. yd. averaging 20.3¢ per yd. ($35 U. S. per oz.); the remainder, at 16.8¢, to be worked hydraulically. Bulolo output for three months ended Aug. 31 was $1,087,240 (U. S.) almost double the figure for the same period in 1951.

★A thin veneer to be sold in world markets, including the U. S., is to be produced from a new plywood plant being built here by the Australian government and **Bulolo Gold Dredging, Ltd.**

PHILIPPINES

★Contrary to a previous announcement, the Atok-Big Wedge mine will not suspend operations. The Court of Industrial Relations conducted voluntary arbitration proceedings, and an agreement was reached after a three-day session. Under terms of the settlement the company is empowered to reorganize and dismiss any employee if conditions demand. It in turn is required to adjust the wage rate such that the average take-home pay will be P2.20 per day with fringe benefits equal to P1.80 more. This would then be equivalent to the minimum wage level of P4. The agreement appears to represent a concession to the gold mining companies, who had threatened to suspend operations if the minimum wage law were enforced to the letter.

★An indication that the outlook for gold mining is viewed with less apprehension, **Benguet Consolidated** recently announced it would increase daily milling rate from 2,400 tons to 2,800 tons per day. October production for Benguet was valued at $314,415 and for **Balatoc** at $266,870, or a total for the **Hausserman**-controlled operation of $581,285 at the statutory price. With gold quoted at P103.50 per oz. in Manila on the open market, where all bullion can now be sold legally, this is actually about 50% more.

★Through the National Power Corp., Government is **constructing a sulphuric acid plant** near Maria Cristina Falls, at Iligan, Oriental Misamis. Pyrites ore from the Rapu-Rapu deposit will be the principal source of supply. Limited amounts of crude sulphur are also available from south Camiguin Island in Cagayan. It is believed that a sufficient supply of pyrite to meet local industrial needs can be had. However ,as all supplies are badly needed, export has been prohibited. Local pyrite runs 40-50% sulphur, is bought by National Power Corp. at P0.65 per unit. Japanese buyers offer P52 per metric ton on the basis of 45% sulphur content c.i.f. Japanese ports.

★Bureau of Mines engineers reported favorably on **possibility of manganese production** from Nueba Ecija province in Central Luzon. Favorable geology is indicated, and several deposits have been located in the eastern part of the province. Sandstone beds can be traced for over 2000 ft. dipping vertically along a creek bed. Above the creek the sandstone was folded, and manganese about 3 ft thick is exposed. The ore appears to be of good grade, and sizable tonnage is indicated. Relative in-

Have you a dust recovery problem?

Bring it to WESTERN PRECIPITATION

... The Only Organization With Years Of "Know-How" In BOTH *Electrical* And *Mechanical* Recovery Methods!

If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field ... WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

Result:

Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields ... knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* ... can give you a direct and unbiased recommendation on the matter ... and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include ...

COTTRELL

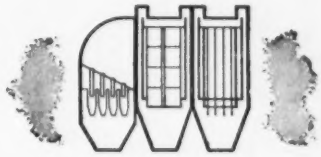
Electrical Precipitators

... the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation* COTTRELLS *give highest recovery at lowest cost per-year-of-service!*

MULTICLONE

Mechanical Collectors

... the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.



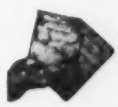
CMP UNITS

(Combination Multiclone-Precipitator)

... combine, in *one* compact installation, both mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) ... and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!



Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. La SALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

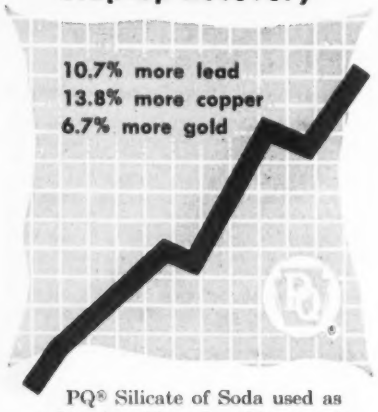
MULTICLONE—T.M. Reg.

It is not necessary to change your present machine to accomodate our Vibrator Screens. The wedge shape of the screen wire with its non-clogging, non-blinding features permits perfect separation on wet or dry screening. The rigid construction adds considerably to the screens capability and efficiency. Proven in hundreds of installations.

SEND FOR OUR ILLUSTRATED LITERATURE

Wedge-Wire
CORPORATION
5602 CLARK AVE CLEVELAND 2 OHIO

Step-up Recovery



PQ® Silicate of Soda used as a flotation aid produced increased recovery as above—from low grade ore. Find out how silicate can improve recovery and profit from tailings. Information available on this refinery's experience by requesting File 27-5.

Non-minerals such as phosphates and clays also use silicate in flotation operations with greatly increased recovery.

Philadelphia Quartz Company
1135 Public Ledger Bldg.
Philadelphia 6, Pa.

PQ SOLUBLE SILICATES

Philippines *(Continued)*

accessibility has held back development, but strong demand from Japanese buyers is expected to bring production this year.

IN AFRICA

★**Rhokana Corp.** will set up a new company to mine copper orebodies near the Belgian Congo border, about 14 mi. from the Nchanga mines. Prospecting indicated about 80-million tons of ore averaging 3.6% copper, and this reserve will be swelled considerably, it is thought, since the deepest holes drilled to date showed values and widths far above the cut-off point.

Ore will be treated by a 150,000-ton-a-month concentrator to be built at Kirila Bomwe, then shipped by rail to the Rhokana smelter at Nkana. New techniques, the company reported, should enable the smelter to produce 4,000 short tons of copper a month without plant additions.

★Rich uranium ore deposits have been turned up in the Mindola section of the Nkana copper mines (owned by **Anglo-American Rhokana Corp.**) it was reported by Dr. Charles F. Davidson, chief geologist of Britain's Atomic Energy Division. The Northern Rhodesian Government said it had no official information respecting such deposits.

★The Territorial Assembly of Mauritania has agreed in principle to the proposed **Societe des Mines du Cuivre de Mauritanie** that would be set up to mine copper ores in the Akjuojt area. It is hoped 20,000 tons of copper a year will be extracted on the spot in the initial phase of operations. The French Government and private companies will put up 600-million francs initial capital on a fifty-fifty basis.

★The Minister of Commerce for the Gold Coast has **spiked rumors** his Government would hike duties on minerals and nationalize the mines. "We would be doing ourselves a lot of harm," said he, "if we give the impression that we are the sort of people who pounce on businesses built here by private enterprise. We shall be depending on British capital for the Volta (See page 141) project."

★**A more liberal tax program for uranium mines** will be advocated by the industry in South Africa. Mr. McLean, president of the Transvaal Chamber of Mines, who said the tax is now equal to the highest imposed on the gold mines, suggested it should be patterned after those customarily applied to new industries.

★**Mufulira Copper Mine,** in Northern Rhodesia, is producing electrolytic copper for the first time, the first unit of its new $11-million plant having gone into operation. Capacity of the first unit is 3,000 tons a month. The entire plant ultimately will produce 6,000 tons a month.

For the present, copper is marketed as it comes out of the tanks, but equipment will be installed by 1955 to cast it in a variety of shapes.

★An agreement with **Blyvooruitzicht Gold Mining Co.** has been expanded to commit the company to treat accumulated slimes as well as current residues for uranium extraction. A much larger plant (around $10-million worth) is therefore planned. Operation is to begin this year.

★Virginia G. M., in which **Kennecott** and other American interests have a hand, will be the principal supplier of sulphuric acid for uranium plants in the Free State gold fields. The acid will be developed from pyritic content of gold-bearing reefs.

IN AUSTRALIA

★**Lead production** in 1953 will amount to 50,000 tons, consumption 45,000 tons, the Department of National Development estimated following a survey of the sub-continent's production facilities. **Copper production** may jump to 30,000 tons, compared to not more than 12,500 tons in 1952, but demand will be for 49,000 tons. Australia hopes to get about 18,000 tons from international allocations. The Department found **tin stocks,** local and imported, adequate to satisfy anticipated demand, rated **tungsten capacity** adequate and capable of expansion should the need arise.

★Samples of rich copper ore have been obtained from a large outcrop of **the Home of Bullion mine,** about 200 mi. north of Alice Springs. Development is proceeding rapidly.

NEW SOUTH WALES

★**North Broken Hill, Ltd.,** reported recovery in the past fiscal year of more zinc and lead concentrates, less silver, than in the year previous. The company treated 337,972 tons of ore, estimates its reserve now is 5-million tons. In the past year, labor disputes affected sales of lead. North Broken Hill now has sufficient manpower.

★**Broken Hill South, Ltd.,** produced 46,882 tons of lead concentrate, 56,927 tons of zinc concentrate in the fiscal year, puts its reserve at about 2-million tons.

A silver-lead mine at Inverell was preparing to produce 35,000 tons a year, and diamond-drilling was under way on a lead-gold property at Charters Towers, Queensland, where surface study gave encouragement.

A 25,000-ton-a-year concentrating plant is being built to handle output of two important orebodies proved at the Zeehan mine and other ores.

NORTHERN TERRITORY

★Specially equipped Dakota aircraft figured in **discovery of more than 100 uranium deposits** in a relatively small part of this territory within two months.

TASMANIA

★**Electrolytic Zinc Company of Australasia, Ltd.,** which has produced more than 2-million tons of zinc at its Risdon plant, is expanding its roasting division to permit treatment of the whole of its zinc concentrates —about 210,000 tons a year.

★**Aberfoyle Tin** announced plans to up production to treat 53,000 tons a year, 16,000 tons more than treated in the past fiscal year, without interruption of operations. Sinking of the main shaft an additional 500 ft. would open up four new levels and considerably augment output from levels now being worked.

VICTORIA

★**Snowy Mountains Mines, Ltd.,** a **new company,** scheduled beginning of operations at its Bendoc wolfram-bismuth mine in April. Wolfram and bismuth will be sold at market prices, minimums fixed for a five-year term.

WESTERN AUSTRALIA

★**Great Western Consolidated** began milling at its Bullfinch gold mine, expected to become Australia's greatest gold producer. The company will treat 20,000 tons a month initially, anticipates ultimately doubling that rate.

IN EUROPE

AUSTRIA

★**Makers of the "Gebus"** electric locomotive have a preliminary contract to establish a branch in Brazil, where Brazilian State Railways is ready to place large orders for equipment of this type. The Austrian electric locomotive industry—which, besides the "Gebus" concern, includes the Siemens-Schuckert works, Simmering-Graz-Pauker, A. G., Elin, A. G., and the Jenbach works—is making a bid also for the Pakistani and other Far Eastern markets.

★Austrian authorities who appealed recently to the International Materials Conference for **a bigger nickel quota** were predicting their annual allocation would be upped to at least 1,000 tons.

GREAT BRITAIN

★The Atomic Energy Division is conducting diamond-drilling on a small scale to determine whether ore-bearing veins of **the derelict South Terras uranium mine** near St. Austell in Cornwall extend laterally or in depth beyond the limits of the mine.

★Only Cornwall mines producing tin in quantity are **Geevor Tin,** getting about 50 tons of ore a month containing 65% tin, and **South Crofty,** whose output has climbed to 45 tons a month after hitting a production slump attributed to water troubles. Geevor's reserve of proved ore is expected to last 20 years. South Crofty may turn to wolfram production.

★Investigation of lead-barytes and gold orebodies in East Africa is being undertaken jointly by **New Consolidated Gold Fields, Ltd.,** and **Colonial Development Corp.**

NORWAY

★Expansion of capacity of **Falconbridge Nickel Works** at Kristiansand, to be undertaken soon and completed 18 months later, will up production of refined nickel from 13,500 to about 15,000 tons a year. Rising ratio of copper content of the ores treated assures increased copper production, as well.

★**The Skorovas mine**—first in Norway to use the Heavy Media process to refine ore—has gone into production, is expected to produce about 150,000 tons of pyrites a year. A 28-mi. cable transporter—longest in Norway—carries ore from mine to port. (Nearly all output will be exported.) Skorovas pyrites contain up to 51% sulphur, about 1.5% copper.

★**The Syd-Varanger iron mines** near Kirkenes—which resumed operation last summer on completion of an £8.25-million reconstruction job made necessary by war damage—is now producing at a rate of nearly 1-million tons a year, most of which is exported to Britain and West Germany. Exports to date have already been enough to pay for all equipment imported for the mines.

YUGOSLAVIA

★A new zinc smelter, now under construction at Sabac, Slovenia, and scheduled for completion next year, will produce about 12,000 tons of electrolytic zinc, 22,000 tons of sulphuric acid, and 40 tons of cadmium a year, says a report from Belgrade. World Bank put up 700 dinars for the project, which would increase zinc export and, at the same time, reduce export of zinc concentrate. (At present, Yugoslavia's only facility for processing zinc concentrate is a small smelter at Cilli, Slovenia.)

WEIGH WITHOUT STOPPING

WHILE YOU **CONVEY**

Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service.

Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO. PASSAIC N. J.

MARTINDALE PROTECTIVE MASKS

PLACE HEAD BAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

Weigh less than ½ ounce

Clean, cool, comfortable. Furnish excellent protection against non-toxic dusts except free silica. Replaceable cotton pads are inexpensive and sanitary.

MARTINDALE Protective Masks	$ .30 ea.
No. 1 Refills (standard weight)	.02 ea.
No. 2 Refills (heavyweight)	.02½ ea.

Masks packed in individual envelopes.
Refills packed in envelopes containing 25.
No. 2 Refills (heavyweight) contain twice as much filtering cotton as the No. 1.

DISCOUNTS

Less than $10.00 list	Net
$10.00 to $24.99 list	10%
$25.00 to $99.00 list	15%
$100.00 and over	20%

Minimum, charge account or C.O.D.	$2.00
Minimum, cash with order	$1.00

If payment accompanies order we will pay parcel post or express charges.

MARTINDALE ELECTRIC CO.
1378 HIRD AVE., CLEVELAND 7, OHIO

NEW BOOKS

Analytical Mechanics for Engineers. Fourth Edition by Fred B. Seely and Newton E. Ensign, both of the University of Illinois. Changes in this new edition are as follows: The discussion of first moments and centroids of geometric figures has been transferred to the Appendix. A general coplanar force system rather than the simplest force system is used to explain the graphical and algebraic methods of determining the resultant of a force system. To introduce the calculus method earlier in the book, greater emphasis is placed on distributed forces in determining resultants of force systems. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 443. Price $5.50.

Phase Transformation of Solids. A textbook for advanced students based on a symposium held at Cornell University in 1948. Edited by R. Smoluchowski, J. E. Mayer, and W. A. Weyl. The first six chapters deal with theory; chapters 7-12, with nonmetals; and chapters 13-17, with metals. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Pp. 660, Price $9.50.

Electroplating. A survey of modern practice including the analysis of solutions by Samuel Field and A. Dudley Weill. Sixth revised and enlarged edition. A valuable handbook on the subject. Published by Pitman Publishing Corp., 2 West 45th St., New York 19, N.Y. Pp. 546, Price $6.00.

A Reconnaissance of Some Idaho Feldspar Deposits. By Verne C. Fryklund, Jr. Includes notes on the occurrence of columbite and samarskite. Published by the Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 30, plus six location maps.

Magnetic Materials. By F. Brailsford, research department, Metropolitan-Vickers Electrical Co., Ltd. A brief book for advanced students covering ferromagnetism, properties and theory of single crystals, factors affecting magnetic properties, iron and silicon-iron alloys, nickel-iron and other alloys, permanent magnet materials. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Pp. 156, Price $1.50.

Nomography and Empirical Equations. By Lee H. Johnson, dean of the College of Engineering, Tulane University. This book describes nomographs and empirical equations—two tools by which an engineer can lessen his work on repeated, routine calculations. They allow him to solve problems simply in a few seconds, and they can be used by helpers who are unskilled in mathematics. Professor Johnson discusses the theory behind various graphical solutions, and describes how to make the best nomograph or chart to solve them. John Wiley & Sons, Inc., New York, N. Y. Pp. 150. Price $3.75.

Weldability of Non-Ferrous Metals. By E. G. West, technical director, The Aluminum Development Association. Metals included in this text are: aluminum and its alloys, magnesium alloys, copper and its alloys, nickel and its alloys, lead and its alloys, zinc and its alloys, low-melting point metals, high-melting point metals, and precious metals. All major types of welding are discussed including: argon-arc welding, atomic-hydrogen welding, submerged-arc welding, carbon-arc welding, oxy-acetylene welding, arc welding, pressure welding, hammer-and-forge welding, flash-and-butt welding, spot welding and others. A very useful table is included which lists physical properties directly related to weldability of 38 metals and alloys. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 553. Price $8.50.

Genetische Lagerstaettengliederung auf Geotektonischer Grundlage. By Hans Schneiderhöhn. This is a significant contribution to the problem of the classification of ore deposits. Here in the United States, Lindgren's classification first proposed in 1906 and amplified later is still the basis of discussion and stands much as it was 20 yr. ago. In Europe, Schneiderhöhn, Niggli, and others have devoted much effort to the further development of the genetic classification of orebodies. Schneiderhöhn, in the book under discussion, summarizes the latest European concepts of the magnetic succession of orebodies. He discusses the inconsistencies of the classification and deviations from the rules.

In the second part he discusses basic ideas for a new genetic classification of orebodies on a geotectonic basis. Many of these concepts have been proposed and discussed in geologic literature for many years and Schneiderhöhn has attempted to erect a new framework on which to marshall known facts in a new order. He attempts to combine and coordinate the latest concepts of ore genesis in a new and logical system of classification based on geotectonic considerations. The resulting theory probably will be found to have as many exceptions and deviations from the rules as has the older theory, but it should stimulate discussion and debate on an interesting and controversial subject. This book is another welcome proof of the present renaissance of geological thinking both here and in Europe. Published by E. Schweizerbart'sche Verlagsbuchhandlung, Johannes Strasse 3/1, Stuttgart-W, Germany. Pp. 42. Price RM 6.00.

The following reports may be obtained from the U. S. Bureau of Mines Publications Distribution Section, 4800 Forbes St., Pittsburgh, Pa.:

I. C. 7640. Active List of Permissible Explosives and Blasting Devices Approved before December 31, 1951. By N. E. Hanna and G. H. Damon. Pp. 11.

I. C. 7639. A Practical Method for Teaching Mine Workers and Officials Use of Gas-Detecting Equipment. By D. S. Kingery and F. D. Baker. Pp. 6 plus 13 illustrations.

R. I. 4859. Investigation of Manganese Carbonate and Wad Deposits in the Batesville Manganese District, Arkansas. By F. A. Rutledge, W. A. Tessmer, Harold B. Ewoldt, Charles Oder, M. J. Langley, and James Bell. Pp. 180 plus 22 illustrations.

R. I. 4861. Electrolytic Manganese Tests in Cooperation with Industry. By Frederick Sillers, Jr. Pp. 81.

R. I. 4895. Investigation of Shamrock Copper-Nickel Mine, Jackson County, Ore. By R. H. Hundhausen. Pp. 12 plus 11 illustrations.

R. I. 4898. Analysis of Crude Shale Oil. By R. F. Stevens, G. U. Dineen, and John S. Ball. Pp. 20 plus four illustrations.

R. I. 4902. Treatment of Titaniferous Magnetite Ore from Iron Mountain, Wyo. By A. E. Back, C. J. Chindgren, and R. G. Peterson. Pp. 15 plus 5 illustrations.

R. I. 4903. Some Characteristics of the Earth As a Conductor of Electric Current. By M. C. McCall and L. H. Harrison. Pp. 9 plus 5 illustrations.

R. I. 4909. Guymard Lead-Zinc Deposit Orange County, N. Y. By G. L. Neumann. Pp. 10 plus 2 illustrations.

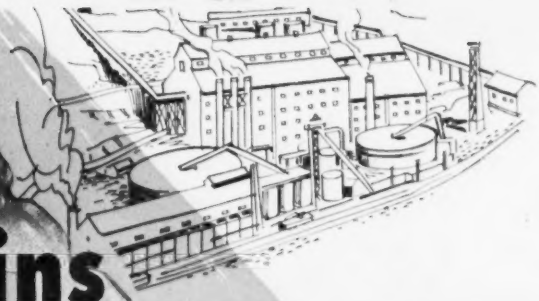
R. I. 4911. Diamond Drilling for Zinc Ore at Andover-Sulphur Hill Iron Mines, Sussex County, N. J. By G. L. Neumann. Pp. 13 plus 2 illustrations.

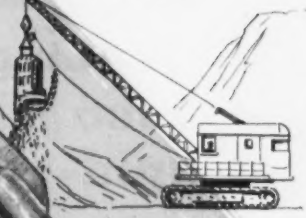
The following publications may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.:

U. S. Geological Survey Bulletin 988-B. Geologic Guides to Prospecting for Carnotite Deposits on Colorado Plateau. By Doris Blackman Weir. Pp. 27. Price 15¢.

U. S. Geological Survey Bulletin 975-B. Geology of the Quicksilver Deposits of Canoas, Zacatecas, Mexico. By David Gallagher. Pp. 38 plus maps. Price $1.

Amsco Chains Get Tougher With Use





How AMSCO Manganese Steel Chains Acquire Progressively Greater Resistance to Impact and Abrasion.

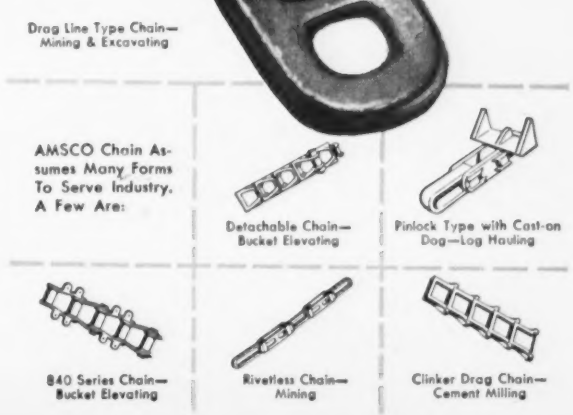
Actual case histories prove that AMSCO Manganese Chains outlast ordinary chains by more than 6 to 1 where impact and abrasion exist. For example, on one conveyor operation, ordinary chain had to be completely replaced every three months. When AMSCO Manganese Steel Chain was installed, only a small fraction of the links were replaced during a test period of over 24 months.

Users of AMSCO Chains benefit by unusual freedom from expensive chain replacement, breakage, maintenance-down-time and other problems caused by impact and abrasion conditions.

AMSCO Manganese Steel Chains have the unique ability to work-harden with use. In rough service, they develop a surface hardness up to 500 Brinell. They also acquire a hard glass-like polish that helps shrug off grinding abrasion. All AMSCO Manganese Steel products — tough when produced — possess the extra-value quality of actually increasing durability with in-use battering and grinding.

AMSCO Chains are made of Manganese Steel —the "Toughest Steel Known." They are produced in many standard and special shapes by American Manganese Steel Division—largest producer of manganese steel for all industry.

If you use chain, and desire a more durable alloy, you are invited to contact AMSCO. There's a good chance we can save you money and provide chains that will outlast your service life expectations.


Drag Line Type Chain—Mining & Excavating
AMSCO Chain Assumes Many Forms To Serve Industry. A Few Are:
Detachable Chain—Bucket Elevating
Pinlock Type with Cast-on Dog—Log Hauling
840 Series Chain—Bucket Elevating
Riveteless Chain—Mining
Clinker Drag Chain—Cement Milling

AMERICAN Brake Shoe COMPANY

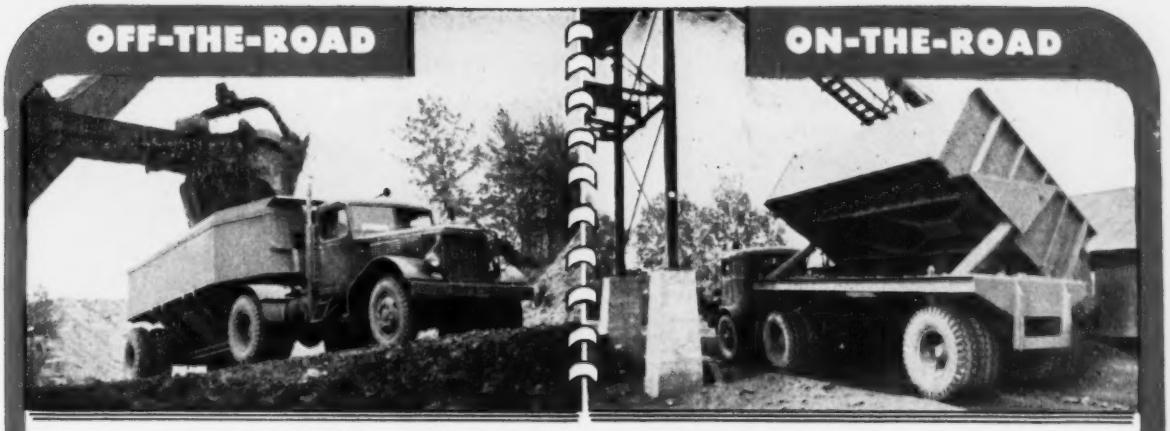
AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; St. Louis, Mo.; Los Angeles, Calif.

Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Quebec.

DIESEL
ELECTRIC



GENERALS go in—get the load—carry it out and over-the-highway

FASTER! EASIER! At Lower Cost!

Pile on the tons. The General L. C. M. is built to move heavy loads out over jagged surfaces without cuts, bruises or snags.

Move more tons over the road on this tough, dependable General H.C.T. Longer wearing, safer running, quicker stopping.

THE GENERAL *L.C.M.*

THE GENERAL *H.C.T.*

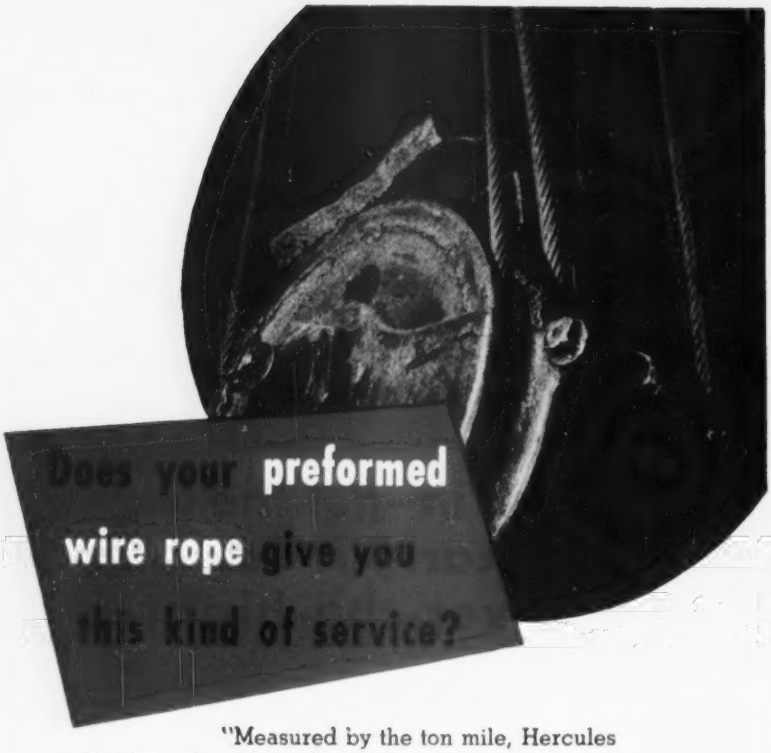
Make Every Worn Tire Work Longer for More Profit!

Your General Tire Dealer will KRAFT SYSTEM RECAP Worn Tires with the New General Truck Tire Tread of Your Choice

KRAFT SYSTEM RECAPPING
A GENERAL TIRE SERVICE

You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recapping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT



"Measured by the ton mile, Hercules Red-Strand preformed outlasts others about two to one," reports one operations manager. Another operator testifies, "Our records show Red-Strand is considerably out in front of four other ropes."

Why HERCULES Red-Strand excels

What's the reason for such performance and praise? In simple terms, it's because *higher-than-rated quality* in Red-Strand preformed delivers *longer-than-expected service.*

If you're not completely satisfied with *your* wire rope service, try Red-Strand preformed. You'll experience the difference too.

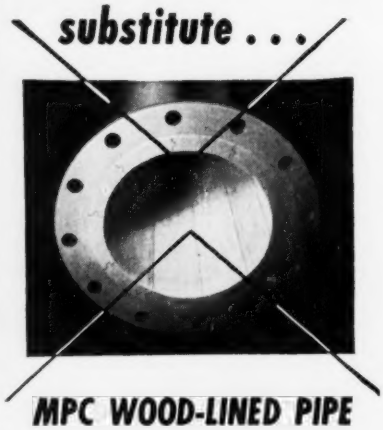
HERCULES® Red-Strand wire rope made by A. Leschen & Sons Rope Company, St. Louis 12, Missouri

In business only to make wire rope ... better wire rope ... since 1857

HIGHER-THAN-RATED QUALITY
LESCHEN
WIRE ROPE AND SLINGS
A. LESCHEN & SONS ROPE COMPANY

DISTRIBUTORS IN ALL PRINCIPAL CITIES

there is NO substitute . . .



MPC WOOD-LINED PIPE MEETS ALL THE REQUIREMENTS FOR A DEPENDABLE MINE PIPE

COMBINES THE STRENGTH OF STEEL WITH THE DURABILITY OF WOOD

MPC Wood-Lined Steel pipe is ideally suited for acid mine waters, culm, and slurries to pressures up to 400 psi. The wood lining, made of clear redwood, Douglas fir, or pine staves, is offered in thicknesses from 11/16" through 3", while the outer carbon steel shell is available from 14 gauge through schedule 80 thickness. Flanges, welded to the pipe, carry ratings of 125 lb. upwards, with A.S.M.E. bolt circle or special drilling. Pipe sections 10' and 20' regular lengths or fabricated to suit. Internal diameters 4" through 48". Pipe exteriors protected against corrosion. Wood-lined fittings available for all diameters in standard and special designs.

Get in touch with your MPC representative or write Dept. E.M.J.

EST. mpc 1869
MICHIGAN PIPE COMPANY
BAY CITY, MICHIGAN

TEAMWORK PAYS OFF. The gigantic walking dragline needs level ground to move on, and the Big Red TD-24 has the power and speed to level it and keep ahead. The TD-24 has the greatest working drawbar horsepower of any crawler on the market and other outstanding features that produce more work at less cost.

Piling it Up for Pyramid

International power will pile it up for you

Pyramid Coal Corporation produces 6,500 tons of soft bituminous coal a day from a mine near Pinckneyville, Illinois. And two Big Red International TD-24 crawlers help do it.

"There's a world of power in those TD-24s and they handle just the way an operator wants them to," says operator Ruby Presswood. "I've dozed chunks of dirt bigger than the tractor itself. One day I moved more dirt than two other big crawlers combined on the same job."

You can put performance like this to work for you. See your International Industrial Distributor right away.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

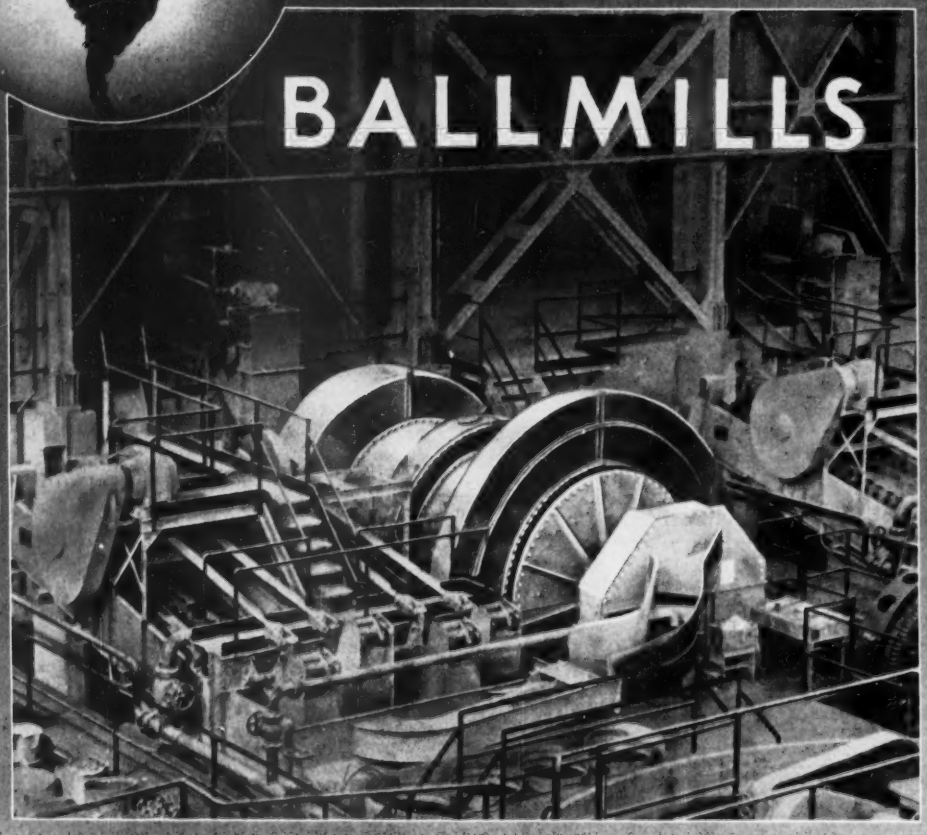
INTERNATIONAL

INTERNATIONAL HARVESTER

POWER THAT PAYS

SMIDTH

BALLMILLS



WET OR DRY GRINDING

OPEN OR CLOSED CIRCUIT

ALSO AIR SWEPT FOR GRINDING AND DRYING

•

For Smidth Machinery apply to:

F. L. Smidth & Co., A/S Vestergade 33, Copenhagen K, Denmark	F. L. Smidth & Co. 11 West 42nd Street New York 36, N. Y.	F. L. Smidth & Co., Ltd., 105, Piccadilly, London, W. 1, England
F. L. Smidth & Cie France 80 Rue Taitbout Paris (9e) France	F. L. Smidth & Co. of Canada, Ltd. 11 West 42nd Street New York 36, N. Y.	F. L. Smidth & Co. (Bombay) Ltd. 42 Queen's Road Bombay, India

"EUC" PERFORMANCE Pays Off IN MINES and QUARRIES

"Eucs" are designed and built for moving coal, rock, ore, overburden and heavy excavation at the lowest cost. The simple but rugged construction of Euclids, combined with large capacity, ample power and speed, provide efficient off-the-highway hauling of practically any material.

Euclids are standard equipment in many leading open pit mines and quarries, and on construction and industrial work. Owners know that Euclid staying power and continuous operation result in more loads hauled in less time at lower cost.

Ask your Euclid distributor for data on quarry or open pit jobs similar to yours. There is a Euclid to meet your requirements for off-the-highway hauling work.

Rear-Dump Euclids—Capacity from 10 to 34 tons—diesel engines from 125 to 400 h.p., spring mounted or semi-rigid drive axles—top speed loaded up to 35.7 m.p.h.

MORE LOADS PER HOUR— MORE PROFIT PER LOAD

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS *Move the Earth*

For TOUGH jobs with years of work ahead...

MARION 111-M Ward-Leonard Electric shovel owned by the Hydro-Electric Power Commission of Ontario, making a cut for an open canal and recovering aggregate for concrete work.

MARION 111-M

Ward-Leonard Electric

Rock and ore have a way of making things rough for an ordinary shovel.

The machine may win, in the first few months, over the stubborn resistance of shot rock. But it still faces the test of time, for rock and ore "wear down" an ordinary shovel and break its spirit.

It's on the tough jobs, with years of work ahead, that the MARION 111-M Ward-Leonard Electric shovel has a chance to prove its real worth. Today this MARION is winning the battle of the rock pile and the ore pit on many a front.

Its victories mean greater production, lower operating cost, less maintenance expense and fewer work stoppages. Its powerful electric muscles and the shock-tested members of its frames and machinery assemblies are making owners say, "This is it!"

It doesn't cost anything to find out what the 111-M Ward-Leonard Electric can do for you. Your nearest MARION office will be glad to give you the facts.

MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

from ¾ cu. yd. to 45 cu. yds.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

See for yourself how Ni-Hard fittings fight abrasion, and cut costs

THESE NI-HARD FITTINGS for HUDSON COAL CO., were produced by Abrasive Alloy Casting Co. Ni-Hard applications include: grinding balls, liners, slurry pump parts, flotation impellers, piping, scoop lips, pulverizer rings, classifier shoes, roll heads, etc.

Ni-Hard®... one of the hardest engineering materials available... is a moderately priced nickel-chromium white cast iron.

Wherever Ni-Hard is used, its remarkable abrasion resistance not only helps to minimize replacements and repairs, but also helps to reduce production costs.

Shown above are Ni-Hard fittings, cast by the ABRASIVE ALLOY CASTING COMPANY of Bridgeboro, New Jersey, for use in discharge lines of Chance Separators operated by THE HUDSON COAL COMPANY of Scranton, Pa.

Heretofore, Hudson Coal used extra thick gray iron fittings for this service.

But the Ni-Hard fittings... installed in 1950 to handle the highly abrasive sand, waste and water mixture at 3,000 GPM... now appear capable of lasting three to four times longer than the thicker sectioned gray iron fittings.

Use Ni-Hard on *your* tough jobs... for lowest ultimate cost.

Investigate Ni-Hard. Get full information... mail the coupon now.

At the present time, the bulk of the nickel produced is being diverted to defense, but nickel is obtainable for the production of Ni-Hard for many end uses in defense and defense supporting industries. There are authorized producers, from coast to coast, equipped to produce Ni-Hard castings in all common forms and shapes.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC.
Dept. 20, 67 Wall Street, New York 5, N. Y.
Please send me free booklets entitled: "Engineering Properties and Applications of Ni-Hard" and "Buyers' Guide for Ni-Hard Castings."

Name _____ Title _____
Company _____
Address _____
City _____ State _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

NOW! THE TOUGHEST SHOT FIRING CABLE EVER PRODUCED!

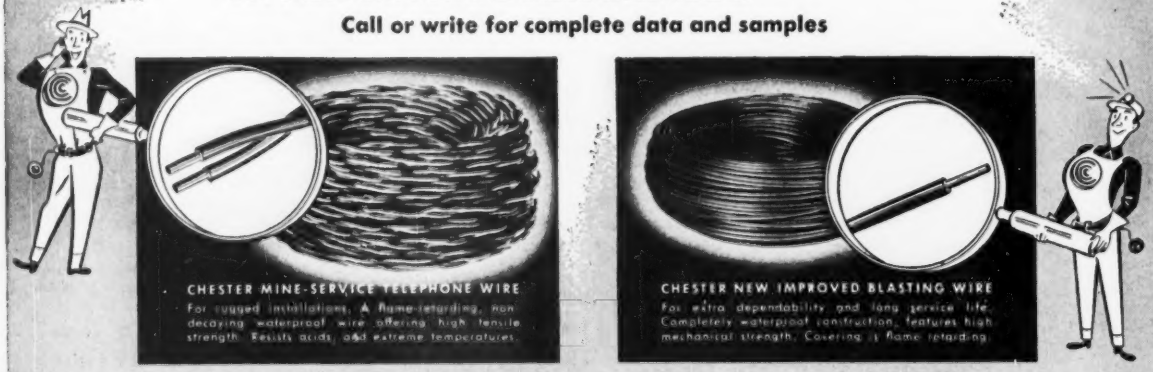
Check the long life qualities offered by this *SUPER DURABLE* **SHOT FIRING CABLE**

- RESISTS SHARP EDGES AND ABRASION
- FLAME RETARDING AND WATERPROOF
- NON-DECAYING AND NON-AGING
- HIGH STRENGTH AND FLEXIBILITY
- NON-CRACKING FROM −40°C to +80°C
- RESISTS MOST ALKALIS, ACIDS, OILS, GREASES
- IMMUNE TO OZONE AND SUNLIGHT

Exclusive CHESTER nylon jacket over center core increases service life and promotes mine safety

Here's the shot firing cable you can depend on for really tough mine service. It's highly durable when exposed to sunlight and ozone, withstands dragging over sharp edges and abrasives and is highly flexible. Non-cracking over a wide temperature range, Chester is flame retarding and waterproof—the kind of cable that's good for years of usefulness in all types of mining operations. Ask for Chester the next time you order — you'll agree, IT'S THE TOUGHEST SHOT FIRING CABLE EVER MADE!

Call or write for complete data and samples



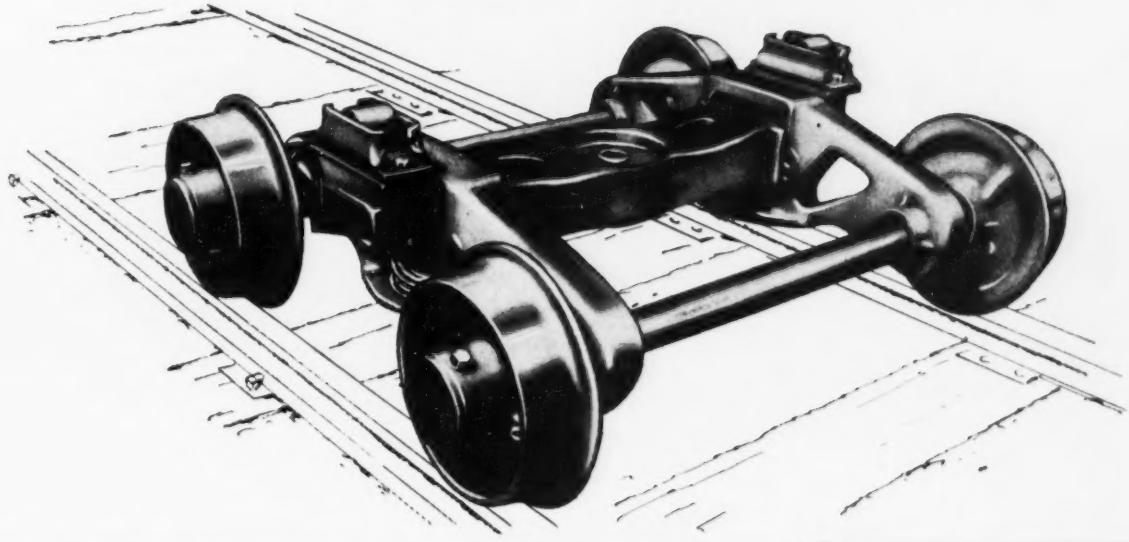
CHESTER MINE-SERVICE TELEPHONE WIRE
For rugged installations. A flame-retarding, non-decaying waterproof wire offering high tensile strength. Resists acids, and extreme temperatures.

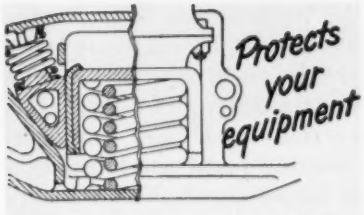
CHESTER NEW IMPROVED BLASTING WIRE
For extra dependability and long service life. Completely waterproof construction, features high mechanical strength. Covering is flame retarding.

CHESTER CABLE CORP.
CHESTER, NEW YORK

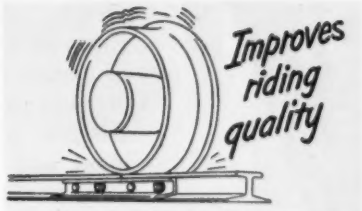
MANUFACTURERS OF QUALITY WIRES AND CABLES FOR EVERY INDUSTRIAL AND COMMERCIAL APPLICATION

Specify NATIONAL NC-1 trucks for your large 8-wheel mine cars

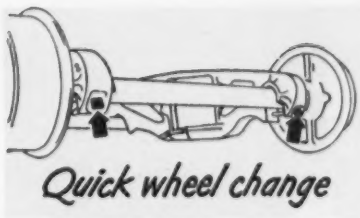




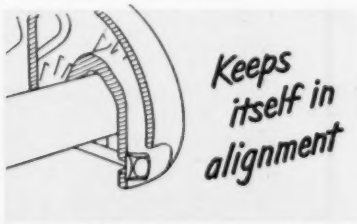
Shock-absorbing system of the NC-1 truck is similar to designs of the American Association of Railroads for full-size freight car trucks. The oscillation control mechanism (see cutaway) floats your loads over the tracks.



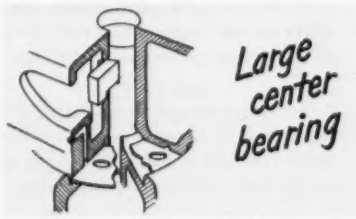
Track irregularities are no hindrance to higher speeds for mine cars when they are equipped with National NC-1 trucks. Truck design and large diameter, low stressed, load-carrying springs improve riding qualities.



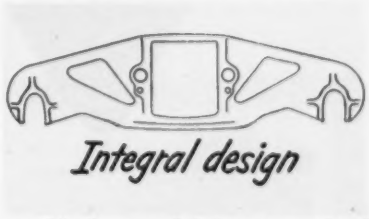
Removal of bolt at each end of side frame permits quick wheel and axle assembly change. Cuts repair time and costs . . . keeps cars in operation longer. No lengthy tie-ups for wheel and axle changes on a National NC-1 truck.



The NC-1 truck stays square automatically. V-shaped slots over the axles make it impossible for the truck to get out of square without lifting entire weight of the car body and lading—means longer service, less repairs.



National NC-1 truck's large center bearing provides maximum wear life by reducing per-square-inch loading... provides bolster stability. Has easily replaceable centerplate shims and adequate provision for lubrication.



Side frame and bolster are each of one-piece, integrally cast construction similar to the National C-1 trucks used on railroads. Gives maximum strength, minimum weight—has *no welds or rivets to shake loose.* A-3930

For minimum maintenance time and spillage, plus maximum equipment protection—specify National NC-1 trucks on your next 8-wheel mine car order.

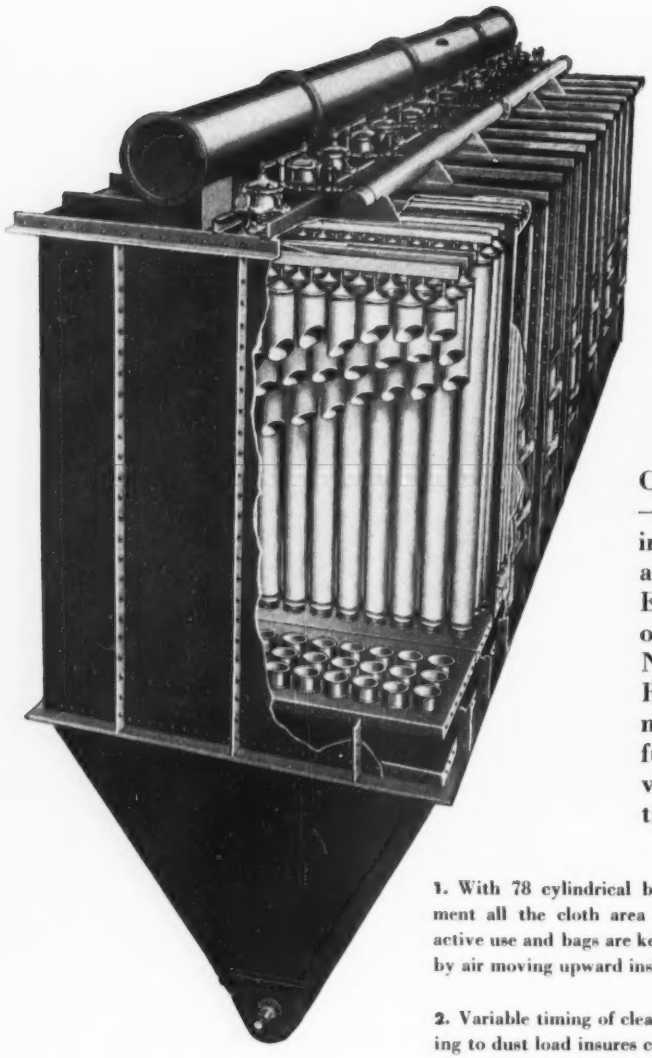
NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

Willison Automatic Couplers • Friction & Rubber Draft Gears • Car Trucks • NACO Steel Wheels • NACO Steel Links & Swivel Hitchings

Round the clock operation at full capacity!



Norblo automatic bag type arrester assures *dust control* for full production

Continuous operation at full rated capacity — handling heavy dust loads by maintaining a constant suction drop across the arrester — is the performance that Norblo Equipment delivers every day in many types of plants. There is *no down time* with a Norblo Automatic Bag Type Arrester. Rugged construction, basic unit compartment and few moving parts combined in a fully functional coordinated design insure very high efficiency and low cost of operation and maintenance.

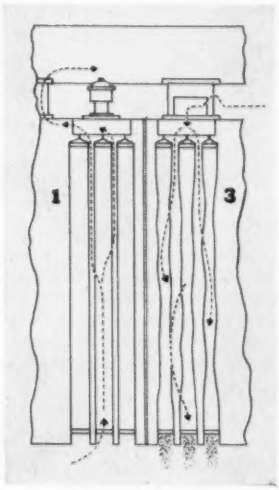
Norblo also builds centrifugal and hydraulic dust collectors, exhaust fans, cement air cooling systems, and portable type dust collectors. Write for literature on any of these.

1. With 78 cylindrical bags per compartment all the cloth area of each bag is in active use and bags are kept fully distended by air moving upward inside the bags.

2. Variable timing of cleaning cycle according to dust load insures constant volume of air handled and of dust collected per square foot of cloth between cleaning cycles.

3. Shaking and cleaning involves only one compartment at a time. During this short period the vigorous reciprocating shaking and reversed air flow insures cleaning of bags.

4. Any compartment may be cut out of operation as long as desired for bag repair, on the clean air side, and all other compartments will remain in operation.



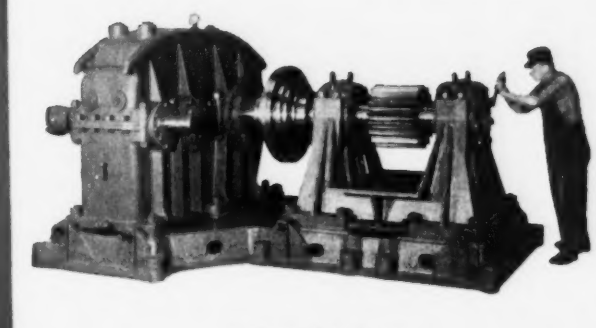
THE NORTHERN BLOWER COMPANY

Engineered Dust Collection Systems for All Industries

6410 BARBERTON AVE., OLympic 1-1300 • CLEVELAND 2, OHIO

When It Comes to
POWER TRANSMISSION
On the BIG JOBS

Look to... **Jones**



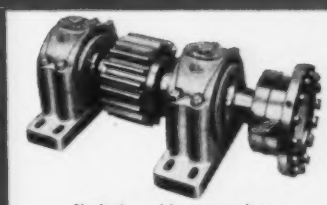
Cement Kiln Drive

SPEED REDUCERS AND COMPLETE DRIVES TO 500 HORSEPOWER

HERRINGBONE WORM GEAR WORM HELICAL

JONES Products—*While specifically* designed for the heavy industries — *are competitive for all applications.* All the added values of sturdier design, heavier construction and better materials are yours without extra cost.

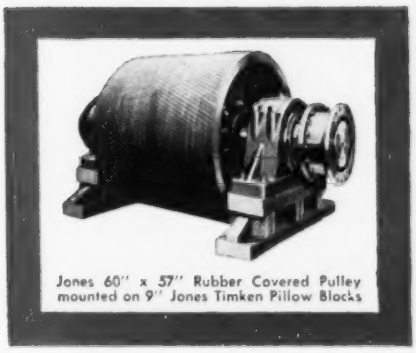
Ask for Bulletins



Shaft Assembly Mounted on 4-15/16" Pillow Blocks

PILLOW BLOCKS to 9" Shaft Size

Timken Equipped, Adapter Sleeve Type
Self-Aligning, Dust-Tight
Sizes to 4-15/16" in Stock



Jones 60" x 57" Rubber Covered Pulley mounted on 9" Jones Timken Pillow Blocks

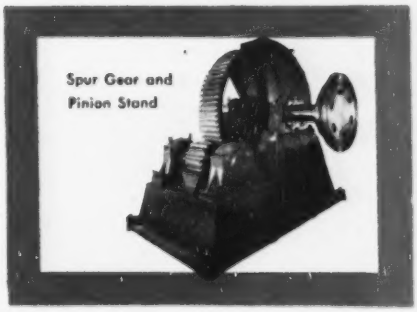
CAST IRON CONVEYOR PULLEYS

Tailor-Made to Your Requirements.

CUT GEARS

to Your Specifications

HERRINGBONE - WORM
HELICAL - BEVEL - SPUR



Spur Gear and Pinion Stand

W. A. JONES FOUNDRY & MACHINE CO., 4465 W. Roosevelt Rd., Chicago 24, Ill.

Since 1890

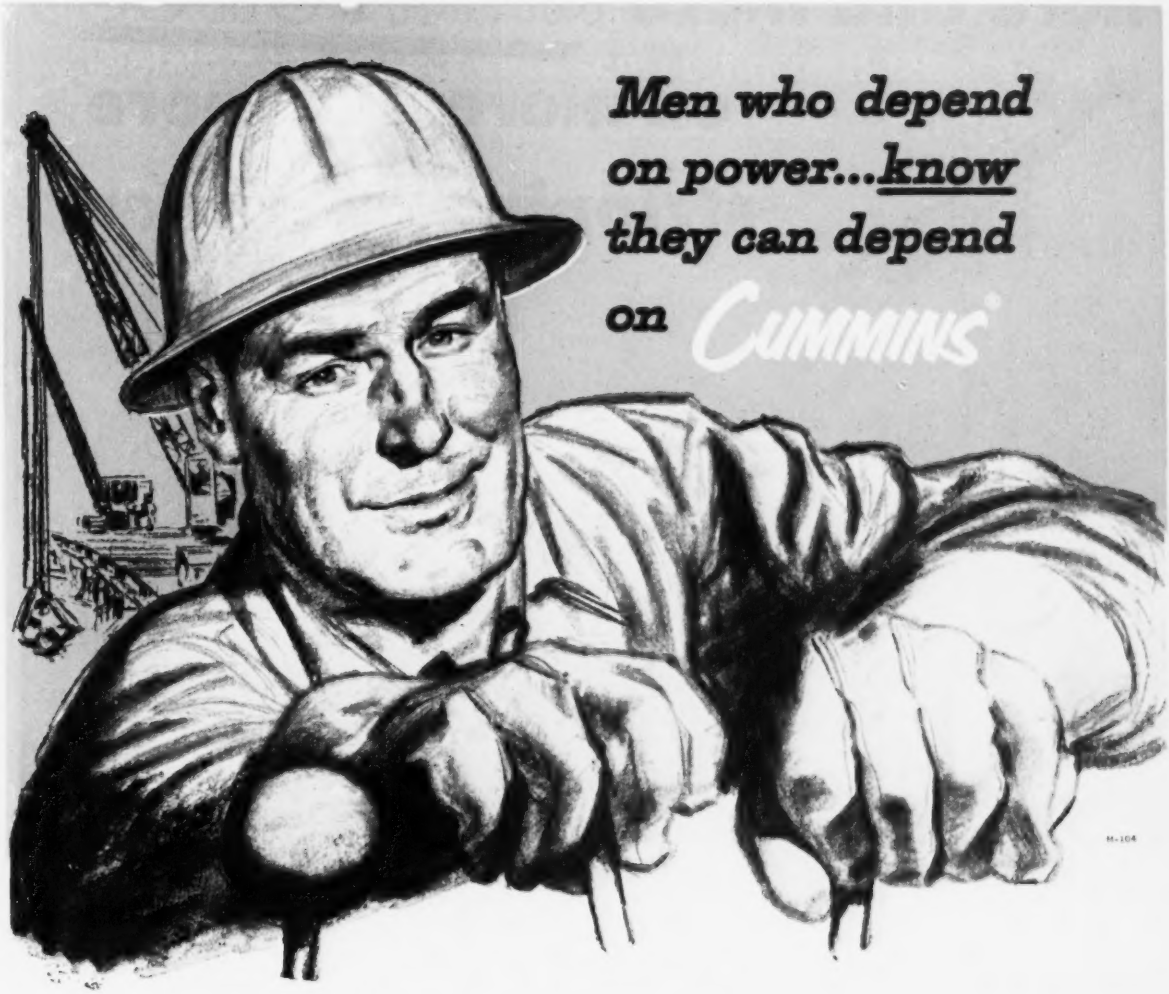
Jones

In The Service Of Industry

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
CAST IRON PULLEYS • CUT GEARS • V-BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS • FLEXIBLE COUPLINGS

HUMBOLDT
Mines Equipment, Mineral Dressing Plants, Crushing and Grinding Machinery, Cement Mill Outfit, Metallurgical Works, Coal Preparation Plants, Steel Constructions for Buildings and Bridges.
Since 1856
DEUTZ
Otto-, Gas-, Diesel-Engines for Every Purpose of Two- and Four-Stroke design, Output range 3–1500 H.P. Cooled by water or air, Diesel-powered tractors, Diesel locomotives, Gas producer plants.
Since 1864
MAGIRUS
Trucks and busses driven by air-cooled DEUTZ Diesel engines, Vehicles for municipal services, Fire ladders, fire engines, Fire fighting water trucks, Two-wheeled ladders, Fire-fighting equipment.
Since 1864
KLÖCKNER-HUMBOLDT-DEUTZ AG · KÖLN U. ULM

Send inquiries to either Köln, Germany or Ulm, Germany



CUMMINS DIESELS **are engineered to make light work of tough jobs**

Progressive, eyes-ahead engineering is one of the big reasons why so many mine and quarry operators pick Cummins Diesels for dependability.

Consider Cummins' exclusive system of fuel injection and metering—an important factor in the unequalled performance records established by lightweight, high-speed (60-600 h.p.) Cummins Diesels. No other Diesel fuel system is so simple . . . so rugged! It delivers a uniform, properly prepared fuel charge to every cylinder. All under low pressure—no chance of bursting and leaking fuel lines.

Your Cummins dealer will be glad to tell you more about the exclusive fuel system and other engineering advantages built into every Cummins Diesel. He is an expert who knows the requirements of your job. He heads up a specialized parts and service organization—equipped to handle all your diesel power needs. Call him today . . . or write!

CUMMINS ENGINE COMPANY, INC., Columbus, Indiana
Export: Cummins Diesel Export Corporation, Columbus, Indiana, U.S.A. • Cable: CUMDIEX

CUMMINS

***Leaders* in rugged, lightweight, high-speed diesel power!**

more and more MANITOWOCS on more and more stripping operations

Peter Kiewit & Son move in big MANITOWOC 4500 to strip Fortune Lake Development

Another big stripping job, and another big Manitowoc takes over. The Fortune Lake open pit mine, in Northern Michigan, owned by Pickands Mather & Co., is being stripped by veteran contractor Peter Kiewit & Son of Omaha, Nebraska.

Kiewit knows earth-moving and knows his equipment too. On the job went a 5 yd. Manitowoc Dragline to handle the difficult assignment. The Manitowoc 4500 had proved its mettle many times previously — proved its ability to lick tough jobs, profitably — so it was only natural to have a 4500 break ground.

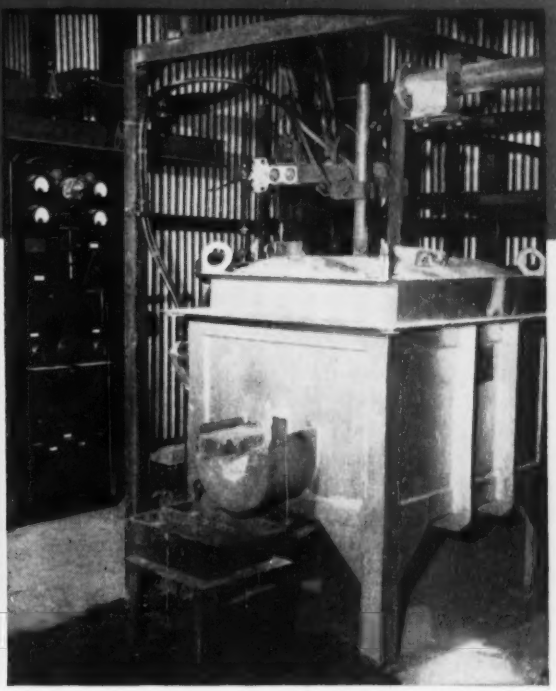
Whether it's ore or coal, mining or stripping, you too will find a Manitowoc the most profitable investment you can possibly make. Included in the Manitowoc line are special hi-lift shovels, long reach draglines, designed for mining and stripping. May we send you complete information? Manitowoc Engineering Corporation, Manitowoc, Wisconsin.

MANITOWOC Speedcrane

SHOVELS 1-5 YD. CRANES 18-100 TON

Weirton Steel recovers scarce tin and steel scrap with the help of three *Lectromelt* * furnaces

Two Lectromelt Reduction Furnaces handle final recovery of tin from scrap at Weirton Steel Co., Division of National Steel Corporation, Weirton, West Virginia.



Sludge formed in tin mill operations emerges from this third Lectromelt Furnace as commercially pure tin.

Baled scrap from the tin mill and other sources is sawed open to expose a maximum surface to the detinning bath—a 50% solution of sodium hydroxide containing sodium nitrate. The tin dissolves and precipitates as a slurry, which is filtered out and treated to form tin oxide. The bare steel is ready for remelting.

A mixture of this oxide and fine anthracite coal is charged into one of two Lectromelt Furnaces, where carbon unites with the oxygen to free the tin. Furnaces are tapped on a 6-hour cycle and tin is cast in 100-pound pigs for shipment to the tin mill.

A second recovery plant at the tin mill recovers the tin from the sludge that accumulates in the plating cells of the electrolytic lines. Thus scarce tin is salvaged in both operations and steel scrap, which otherwise would be undesirable because of its tin content, is reclaimed.

For information on Lectromelt Furnaces, write Pittsburgh Lectromelt Furnace Corporation, 322 32nd Street, Pittsburgh 30, Pa.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

Now at

CHUQUICAMATA

(CHILE, S. A.)

SHEFFIELD MOLY-COP

TRADE MARK

COPPER-MOLYBDENUM-ALLOY

Grinding Balls

Used and PROVED Around The World

Deliver Higher Efficiency and Economy

THE STORY of Chuquicamata can be told only in superlatives . . .

THE LARGEST known copper orebody in the world, will produce more than 300 million pounds of blister copper a year, and treat 30,000 tons of ore a day. The Anaconda workings are a landmark in mining operations.

SHEFFIELD MOLY-COP GRINDING BALLS play a vital role in this record-breaking project. Their longer service in the new sulphide concentrator means lower grinding costs, fewer chargings, and less "down time."

SUPERLATIVE PERFORMANCE of Sheffield Moly-Cop grinding balls is the result of years of research, and quality-controlled methods of manufacture—from initial alloy steel production to final heat treatment.

LET SHEFFIELD prove how Moly-Cop Grinding Balls will do a better job for you.

SHEFFIELD STEEL CORPORATION

HOUSTON KANSAS CITY TULSA

SUBSIDIARY OF ARMCO STEEL CORPORATION

Export Representatives: ARMCO INTERNATIONAL CORPORATION, MIDDLETOWN, OHIO

How to Reclaim Valuable Surface Material on Abandoned or Worn-Out Roads

You don't have to abandon thousands of tons of useful, valuable aggregate (and binder) when relocating roads. You don't have to face the time and expense of ripping up, loading and hauling away the material.

With HYSTER GRID ROLLER you can now salvage and use the old bituminous pavement—saves both time and money. Here is the procedure when old road is to be abandoned:

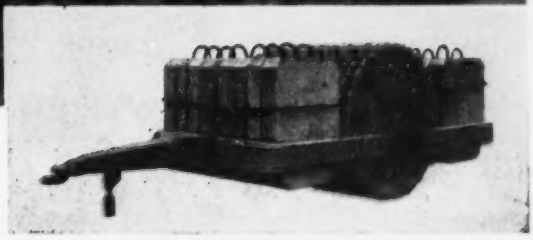
1. Scarify old surface, using motor grader or ripper.
2. Grid Roll chunks without removing from roadbed. An average of 10 passes at 5 miles per hour reduces chunks to the original, loose aggregate mixture.
3. Windrow the salvaged material and load it out with scrapers, conveyor-type loaders, or other conventional equipment.
4. Re-lay salvaged material on properly prepared new roadbed (or stockpile, if desired).
5. Add small amount of binder to salvaged material (amount required varies with condition of binder remaining in salvaged aggregate).
6. Roll new surface (composed of salvaged material) using Hyster Grid Roller.
7. Apply seal coat, if desired.

When maintaining or rebuilding worn-out roads, the procedure is the same except for point No. 3; instead, salvaged material is windrowed on shoulder and the Grid Roller is used to compact and prepare sub-base.

Ask your Caterpillar-Hyster dealer for information about the new Hyster Grid Roller, or write for catalog.

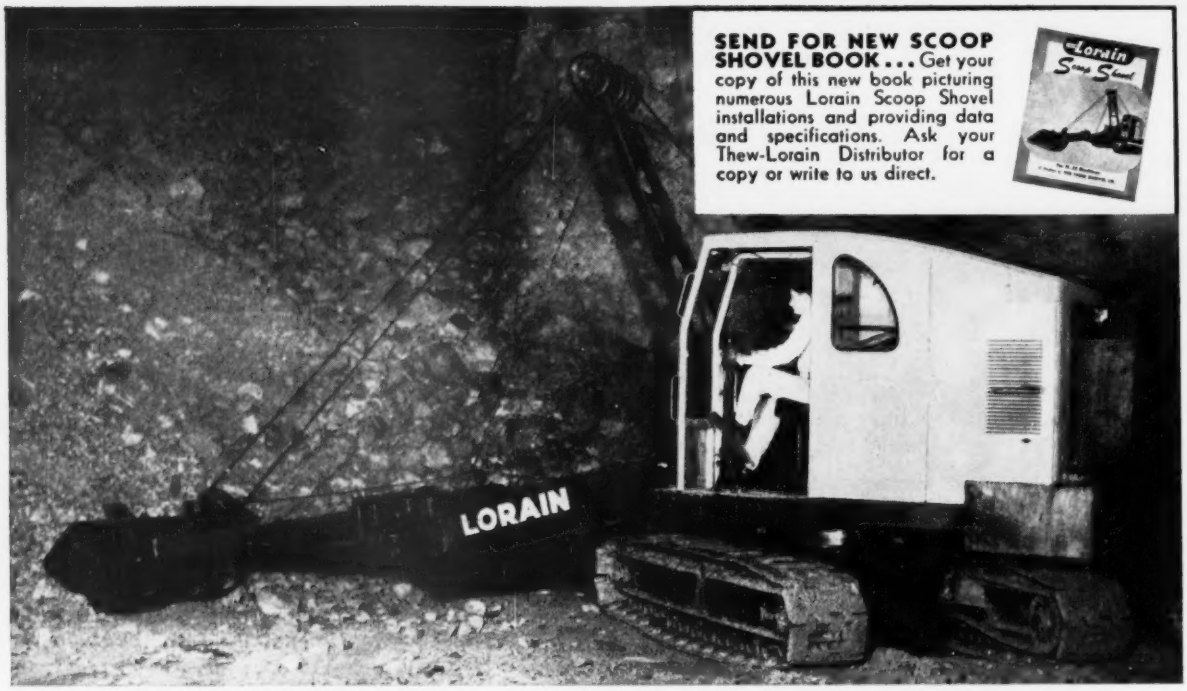
2,500 YARDS OF AGGREGATE SALVAGED ON CALIFORNIA ROAD JOB

Pictured are scenes taken on a recent road re-location job in California. Over 2,500 yards of aggregate were salvaged from the abandoned road, using the Hyster Grid Roller. The procedures outlined were used on this job. After the Grid Roller had salvaged the material, it was loaded out and removed from the old road bed, with Caterpillar DW-10 Tractors and Scrapers, stockpiled (while fill material from the old road was used to provide fill material for new road), then re-layed to form new surface.



HYSTER COMPANY

2965 N. E. CLACKAMAS STREET.....PORTLAND 8, OREGON
1865 NORTH ADAMS STREET.....PEORIA 1, ILLINOIS



SEND FOR NEW SCOOP SHOVEL BOOK . . . Get your copy of this new book picturing numerous Lorain Scoop Shovel installations and providing data and specifications. Ask your Thew-Lorain Distributor for a copy or write to us direct.

Eagle-Picher Mine uses *NEW* LORAIN Scoop Shovel

A RUBBER-TIRE MOUNTED SCOOP SHOVEL LOADING FROM STOCKPILES

NEW LORAIN SCOOP SHOVEL IN UNDERGROUND LIMESTONE QUARRY

THEW LORAIN®

Out in a Cardin, Oklahoma, lead mine, there is a new idea at work. It is the Eagle-Picher's Tri State Mine . . . and the new idea is a Lorain Scoop Shovel. Eagle-Picher have put the Lorain Scoop Shovel to work in cramped underground conditions and find outstanding advantages in this revolutionary loading method. The Scoop Shovel, in photo above, loads an average of 600 to 700 tons per shift at a cost reduction approximating $50 per day over former methods. It will pay you to investigate the reasons why Eagle-Picher put this new, modern Lorain method to work.

SCOOP SHOVEL ELIMINATES TRAVEL

For mines, pits and stockpile use, the Lorain Scoop Shovel now brings new advantages in high-speed loading. It is a new front-end attachment for the popular Lorain TL-25 "Series". The turntable can swing a full 360° to dig and dump, to load from face to trucks. This, plus the extra-long 24 ft. reach of its telescopic boom, enables the Scoop Shovel to work a wide radius with no crawler travel. The job can be "cleaned up" easily — trucks can move in close for efficient, time-saving loading. The Scoop Shovel can load on the down-grade, on the level and on the up-grade. Standard bucket capacity is 1¼ cu. yd. and the bucket can lift to a dumping height of 14 feet to load into the largest hauling units; or it will operate in headroom as low as 10' 6". Operator visibility is at its very best.

CONVERT LORAIN TL-25's IN THE FIELD

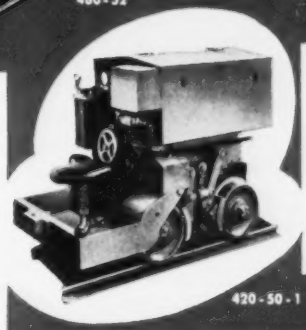
Present Lorain TL-25 owners can quickly and easily convert their present machine to the new Scoop Shovel front end. Here is new versatility in your Lorain TL-25 . . . this makes a sixth front end type to fit any loading condition or handle any material. If you are looking for a new approach to loading economy in your mine, do not fail to investigate the new Lorain Scoop Shovel method. Your nearby Thew-Lorain Distributor can tell you the full story.

THE THEW SHOVEL CO., LORAIN, OHIO

"GO MODERN" with JEFFREY LOCOMOTIVES

for LOW COST METAL MINE HAULAGE

480-52



420-50-1

Trammer Locomotives

Storage Battery type shown — weighs 1½ tons. Can also be arranged for trolley or cable reel operation.

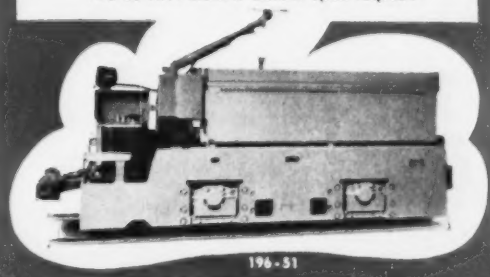
● Over the years Jeffrey Locomotives of various types have been used extensively in metallic and non-metallic mining operations. The Jeffrey line includes, Storage Battery Trammers, Combination Storage Battery and Trolley Types and Trolley Locomotives.

The illustration above shows a 15-ton Trolley Locomotive with these features: air-operated Contactors, Brakes, Sanders and Horn; anti-friction Journals and Motor Axle Bearings; Blowers to ventilate Motors. Here are the dimensions: wheelbase—100", 36" gauge, length—21'8", width—67", height over cab—72", height over covers—44", diameter of wheels—38".

Let a Jeffrey engineer help you determine the locomotive best suited to your operation.

Combination Storage Battery and Trolley Type Locomotive...

12,000 pound chassis and 30" gauge. Two 30 H.P. motors. Details upon request.



196-51

THE JEFFREY MANUFACTURING COMPANY

Established 1877

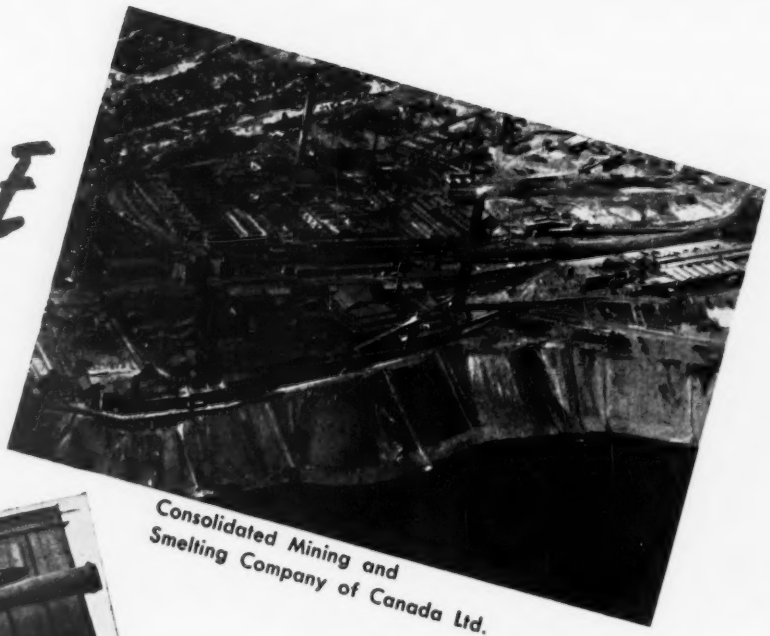
974 North Fourth St., Columbus 16, Ohio

MINING, MATERIAL HANDLING AND PROCESSING EQUIPMENT

Baltimore 2 · Beckley, W. Va. · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 15 · Denver 2 · Detroit 13 · Ferry Port, Pa. · Huntington 2 · Jacksonville 2 · Milwaukee 2 · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 1 · Salt Lake City 1

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio

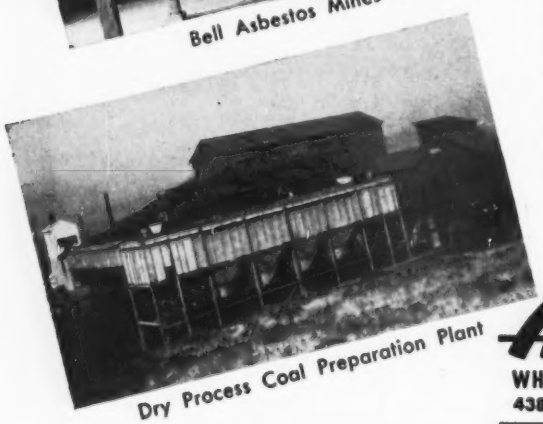
WHAT *DUSTUBE* EFFICIENCY MEANS



Consolidated Mining and Smelting Company of Canada Ltd.

Federated Metals Division

Bell Asbestos Mines Ltd.



Dry Process Coal Preparation Plant

in the *MINING* and *METALLURGICAL INDUSTRY*

NEARLY COMPLETE RECOVERY OF VALUABLE PRODUCTS IN A USABLE STATE. Uniform recoveries of dust and/or fume approaching 100% are commonplace with Dustube Collectors. Their simple cloth tube design is the most dependable method of dust removal that will insure a clean stack under a wide variety of operating conditions. Material is collected in a dry state and can be reused without the necessity of thickening, filtering, or drying.

MECHANICAL HANDLING OF COLLECTED DUST OR FUME. Collected material can be automatically discharged from hoppers by means of screw conveyors or other handling devices. It can be conveyed to a common point for reprocessing to save hours of manual handling.

LOW INITIAL COST — LOW MAINTENANCE COST. A lower capital investment is required for Dustube Collectors due to their simple cloth tube design. They have the inherent capacity for continuous, severe service with a minimum of downtime.

CUSTOM DESIGNED TO FIT EXISTING FACILITIES. Dustube Collectors are tailored for your particular dust and fume applications. They can be built to fit existing or new plant buildings, flue lines and ground contours.

GET COMPLETE DETAILS today. Send for Catalog 372.

American
WHEELABRATOR & EQUIPMENT CORP.
438 S. Byrkit St., Mishawaka Ind.

dustube® COLLECTORS

A gravel pit owner reports . . .

J & L JALLOY

"HAD 'EM SKUN A MILE"

At Left—Walter Stevens holds up J&L Jalloy cutting edge which lasted 2½ years before replacement. Only ⅛" thinner than when new.

Above—It takes tough steel to withstand digging material like this!

Above—Walter Stevens rams loader bucket into gravel bank to pick up another load of gravel.

MAINE STEEL INC. uses tough J&L JALLOY to decrease "Downtime" on Hydraulic Loader at H. H. Stevens Co.

We're pretty pleased with the way Mr. Walter Stevens of H. H. Stevens Sand & Gravel, Gorham, Me., feels about J&L Jalloy.

Mr. Stevens is using a "Straight-Line" hydraulic loader, built by Maine Steel Inc., to load trucks with the sand and gravel from his pit. It's tough work. The loader bucket is rammed into the gravel bank at high speed reverse, which means the severest kind of impact and abrasion on the equipment.

To decrease service interruptions to the work of its loaders, Maine Steel has used ½" x 6" Jalloy plate for the bucket's cutting edge.

Here's how Jalloy has worked out— Mr. Stevens reports, the first cutting edge of Jalloy lasted 2½ years—loaded 40,000 cubic yards of sand and gravel.

Mr. Stevens sums it up this way. "*That blade saved me quite a bit of money.*"

And Maine Steel Inc. is pleased with J&L Jalloy too— P. J. MacDonald, Maine Steel Welding Foreman, reports Jalloy is no trouble at all to weld using a regular coated rod.

Finally, Mr. G. C. Soule, President of Maine Steel, says that HE'LL CONTINUE TO SPECIFY J&L JALLOY FOR ALL CUTTING EDGES.

Why not write today for our booklet, "*For Longer Wear . . . Less Repair.*" It will give you complete information on Jalloy, plus examples of how other mining and quarrying men are using this modern mining steel to save them money. The coupon is for your convenience.

J&L STEEL

Jones & Laughlin Steel Corporation
412 Gateway Center
Pittsburgh 30, Pa.

Please send me a free copy of your booklet, "For Longer Wear . . . Less Repair."

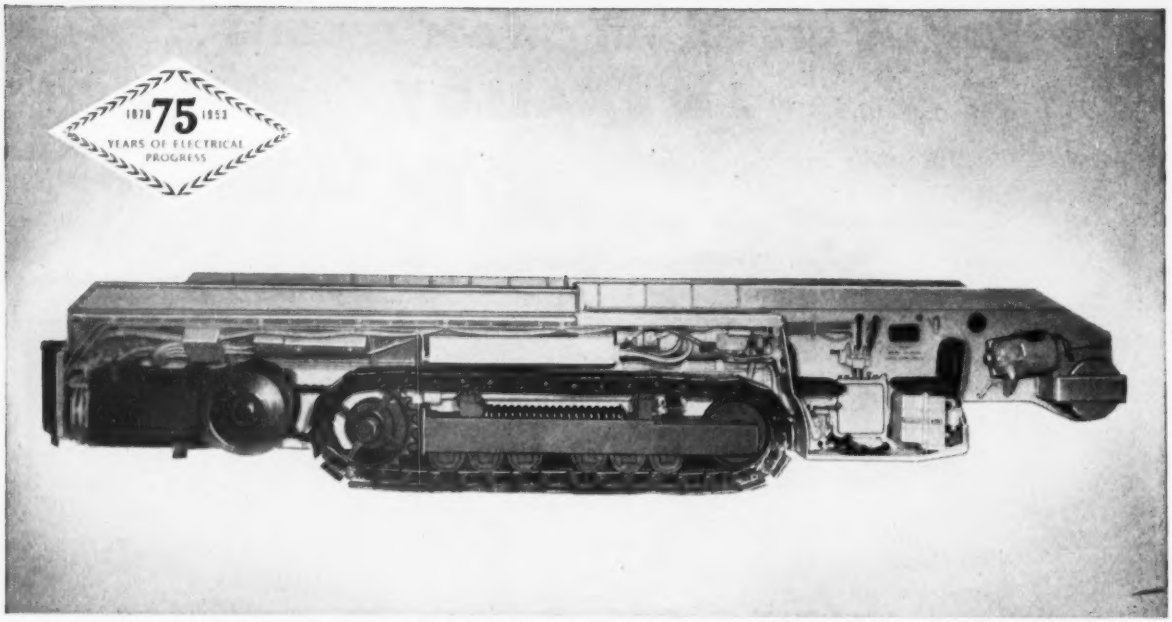
Name _____

Company _____

Address _____

_____

JONES & LAUGHLIN STEEL CORPORATION PITTSBURGH 30, PA.



G-E CABLE-REEL SHUTTLE CAR IS HIGHLY MANEUVERABLE, HAS 14-FOOT TURNING RADIUS

Quantity Production of G-E Shuttle Car Under Way

Extensive Field Tests Prove Its Versatility, Easy Maintenance Under Rigorous Mining Conditions

Eighteen months ago the G-E cable-reel shuttle car went into service under actual mining conditions to prove its worth. After heavy-duty service under all types of conditions—wet bottoms, narrow passageways, sharp turns—the verdict of operators was enthusiastic. Now, with quantity production under way, you can take advantage of this timely tool for more efficient, economical mining.

Crawler Treads Allow Large Capacity

Crawler treads on the G-E shuttle car make possible a wide conveyor, great carrying capacity, and excellent maneuverability either in passageways or at the loading machine. Ground pressure with the empty car is only 10 pounds per square inch. When fully loaded, using sideboards, the car still has only 20 pounds per square inch ground pressure.

Only 42″ high, the shuttle car has a carrying capacity ranging from 190 cubic feet to 300 cubic feet (with 12″ sideboards). This is approximately 30% greater capacity than is now obtainable with cars of conventional design.

Dual Seating Arrangement on Shuttle Car

All motors and control devices meet U.S. Bureau of Mine's specifications. A dual seating arrangement with two conveniently-located control handles permits operation in either direction with maximum visibility and comfort.

Construction of the G-E shuttle car is rugged and *simple* throughout. The two driving motors are readily accessible and easy to maintain. Working parts are easy to get to, easy to service.

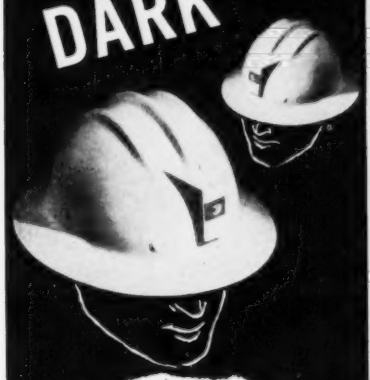
Investigate today the many advantages and economies that can be obtained with the new G-E track-laying cable-reel shuttle car. For full information, contact your nearest G-E sales office. *General Electric Co., Schenectady 5, N. Y.* 120-61

End view of G-E shuttle car shows wide conveyor and large carrying capacity made possible by crawler treads.

You can put your confidence in—

GENERAL ELECTRIC

IN THE DARK



GLOWING HARD BOILED* HATS Mean Safety Plus!

GLOWS eight hours after five minute exposure to artificial or daylight. Phosphorescent finish molded into *white* crown. Other models offer unlimited choice of color. Stronger-than-steel molded Fiberglas gives complete protection, exceeds all government and industrial tests for safety including electrical hazards. Your choice of Hard Boiled hats or caps.

Easy to Wear

Comfortable, full-floating headband assembly allows air to circulate through hat.

"One Size Fits All"

—adjustable headband cuts inventory and insures perfect fit. Headband assembly replaceable in seconds, to restore new hat feel.

EVERYTHING BULLARD IN SAFETY *tm reg. HARD BOILED

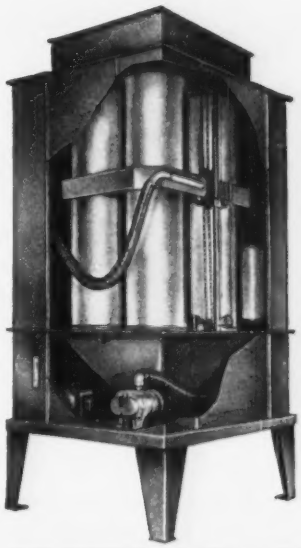
Distributors in Principal Cities

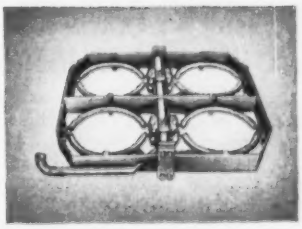
E. D. BULLARD COMPANY
275 EIGHTH STREET, SAN FRANCISCO, CALIFORNIA

AEROTURN "ON THE JOB"

5 REASONS Why AEROTURN Can Do A Better Dust Collecting Job For You . . .

1. AUTOMATIC SELF-CLEANING OF FILTER prevents dust accumulation around filter elements. NO costly "downtime" for filter cleaning. NO costly manual cleaning.
2. 50% to 75% SAVING IN ERECTION TIME due to **AEROTURN'S** Unit Assembly Design. Precision manufactured, prefabricated sections readily assembled. All parts prime painted, boxed for shipment.
3. MINIMUM OF PLANT SPACE REQUIRED — uses only ⅓ to ½ the space required by other types of dust collectors of comparable capacity.
4. **AEROTURN** DUST COLLECTION "KNOW-HOW" built in to all AEROTURN Dust Collectors. *High efficiency and automatic self-cleaning design tested and proven in hundreds of installations.*
5. **AEROTURN'S** EXCLUSIVE BLOW RING CRADLE — a patented, fully automatic, self-adjusting, self-aligning blow ring assembly holds the rings snugly in contact with the wool felt filter bags at all times for maximum efficiency and filter bag service.





Licensed under Hersey Patent Rights. Other Patents Pending.

READ ABOUT "UNIT ASSEMBLY" DESIGN FOR EASY INSTALLATION

WRITE FOR THIS BOOK — SEE HOW THE AEROTURN DUST COLLECTOR CAN SOLVE YOUR PROBLEM.

NAME _____

COMPANY _____

STREET _____

CITY _____ ZONE ___ STATE _____ E

TURNER & HAWS ENGINEERING CO., INC.
100 SIMBROCO ST. BOSTON 32, MASS.

EXTRA Go-Power

WITH

STERLING-WHITE Plan-A-Power

Up to 50% LONGER TIRE LIFE

TO GET the perfect "high-low" combination—high production at low operating cost—there's only one answer proved by experience under the most rugged conditions.

Go Sterling-White!

Husky Plan-A-Power assures positive traction. Built for rugged, fast, heavy haulage duty, Sterling-White is built to really take it . . . day after day.

They're tailored to *your* heavy hauling needs. Get the facts from your nearest Sterling-White Representative.

THE WHITE MOTOR COMPANY

STERLING DIVISION • **Cleveland 1, Ohio**

The White Motor Company of Canada Limited—Montreal

Export Department—Cleveland 1, Ohio, U. S. A.

Sterling White

You'll *MOVE* with Sterling-White!

Wheel spinning and slippage reduced to a minimum because you really get the traction . . . get the action . . . with the big loads. Super-traction differential divides power to each rear wheel exactly as road and load conditions demand. Maximum strength for more go-power . . . for 50% longer tire life. Your Sterling-White Representative will show you why.

Improved Fragmentation–Reduced Concussion–Increased Safety

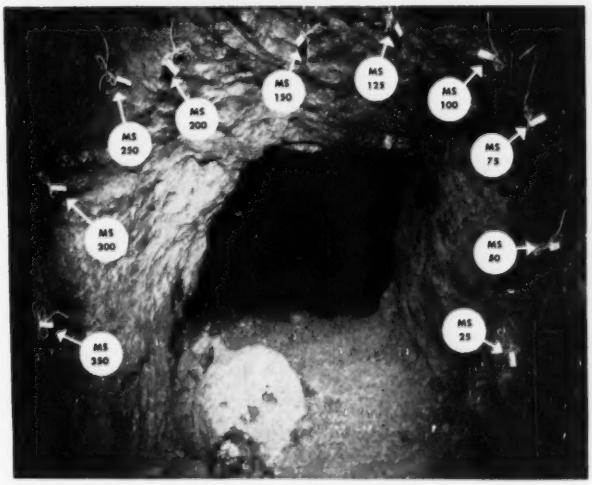
IN ORE MINE USING DU PONT "MS" DELAY ELECTRIC BLASTING CAPS

To obtain superior fragmentation . . . reduce concussion . . . and increase the safety of underground blasting operations, many prominent iron ore mines are using Du Pont "MS" (Millisecond*) Delay Electric Blasting Caps.

Miner (at left) makes up primer with "MS" Cap for typical shot in a sub-level stope of midwestern iron ore mine. In this case, the blast consisted of 10 holes in a vertical ring parallel to the stope face and having a horizontal burden of eight feet. Hole depths ranged from 20 to 25 feet.

The shot contained a total of 300 pounds of "Gelex" No. 2, 2" x 16", a cohesive semi-gelatin which has proved very popular for mining iron ore. The holes were primed full depth with Primacord and were initiated with Du Pont "MS" Delay Electric Blasting Caps arranged as indicated in the lower photo. This midwestern mine has consistently reported (1) better breakage, (2) substantially reduced concussion, and (3) improved safety resulting mainly from less unexploded dynamite in the muck pile.

Like all Du Pont electric blasting devices, these split-second "MS" Caps are made with waterproof rubber-plug closures, plastic insulated wires and aluminum foil shielded shunts . . . assuring the utmost in safe handling and use. A steadily growing number of ore mines are discovering that "MS" Delays provide greatly improved over-all efficiency as compared to former blasting methods. Why not try them in your own mine? The Du Pont Explosives representative in your own area will gladly give you complete information on these short-interval delays and other Du Pont blasting supplies and accessories. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.



*"*MS*" *Delay Electric Blasting Caps are available in 14 millisecond delay intervals: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450, -500.*

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DUPONT

BETTER THINGS FOR BETTER LIVING. . . THROUGH CHEMISTRY

Quick replacement paves way for NEW RECORDS with REPUBLIC CONVEYOR BELTING

Everything wears out sooner or later . . . **even Republic Conveyor Belts!** The important thing is getting your money's worth from the product while it's working . . . to be prepared for the final day so replacements come smoothly, quickly and without surprise.

The arrow above shows an oil-resistant Republic Conveyor Belt that moved oily "debris and wet rock tailings" from the classifiers up a 15° incline of International Mineral and Chemical Company's Peace Valley Phosphate Mine in Florida. A tricky load and a tough job, but there's no doubt about performance here! Twenty-four hours a day, seven days a week this Republic Belt worked without rest. After more than five years it had moved over **10 million long tons** of material containing oily chemical reagments which destroy the conventional type of natural rubber conveyor belt. The belt did its job. More than that, it broke performance records. When it finally wore out, Republic's local Distributor was on hand with a replacement and the switch was made smoothly and economically. It's the kind of story you'd expect from Republic . . . the right combination of product excellence and expert servicing that results in a long-lasting profitable relationship between you and the specialist in Industrial Rubber Products.

Your local Republic Distributor can help you lick any problem regarding selection, application and maintenance of Industrial Rubber Products. Write today for the name of your local Republic Distributor who will keep you posted on new developments of interest to your business.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

HOW TO recover base metals by leaching

best ways to

- crush
- grind
- precipitate

Here is a practical reference guide that fully explains all steps in the recovery of base metals by leaching—from the preparatory ones of crushing, grinding, and roasting, through the leaching processes and the final precipitation of the metal. All kinds of information—operating data, flow diagrams, cost figures, equipment descriptions—are included to make this book as clear and useful a guide as possible.

Just Published!

HYDROMETALLURGY OF BASE METALS

George D. Van Arsdale

Editor-in-Chief

Prepared with the assistance of

The Dorr Company Staff

360 pages, 6 x 9, 47 flow sheets and other illustrations, 106 tables, $9.50

Into this book is packed the know-how, from forty years of experience, of *George D. Van Arsdale*, for many years the world's leading authority on the subject.

Here are contributions from members of the senior engineering staff of *The Dorr Company* — all leading chemical, metallurgical, and industrial engineers.

Here are operating data from successful leaching plants—all of them checked by *officials of the plant* they come from.

All this information is brought to you here in one thorough, up-to-date book, covering the whole field of hydrometallurgy as it applies to base metals.

Look for these special features

► Emphasizes copper, and covers also zinc, nickel, lead, cobalt, manganese, tin, antimony, cadmium, vanadium, uranium and radium

► Shows best crushing, grinding, and roasting practices, including fluidizing

► Considers which mechanical, chemical, and economic conditions will enable a plant to leach minerals at a profit

► Offers several techniques of solution separation

► Tells how to precipitate by both electrolytic and chemical methods

► Gives new techniques, such as uranium leaching as recently developed in the Colorado Plateau area, and the treatment of cobalt in Rhodesia

► Covers such special topics as the Caron nickel process . . . production of electrolytic manganese . . . heap-leaching of copper ores . . . production of electrolytic antimony

SEE THIS BOOK 10 DAYS FREE

McGraw-Hill Book Co., 330 W. 42nd St., NYC 36

Send me a copy of **Van Arsdale's HYDROMETALLURGY OF BASE METALS** for ten days' examination on approval. In 10 days I will send $9.50, plus a few cents for delivery, or return the book postpaid. We pay for delivery if you remit with this coupon; same return privilege.

(Print)

Name .....

Address .....

City ..... Zone.... State.....

Company .....

Position J-1

This offer applies to U.S. only

FUMEALL

superior filter fabric

TAILORED TO FIT YOUR NEEDS...

Smelter bags of tailor-made **FUMEALL** filter fabric are now operating in the bag houses of many of the world's most important smelters. The operating records of **FUMEALL** filter bags show substantial savings over conventional fabrics...often giving as much as four times the service of all-wool bags.

FUMEALL, a combination of virgin wool and Dynel, combines the undisputedly superior filtering qualities of wool with the strength, heat, acid, alkali and moisture-resistance of Dynel.

FUMEALL is tailor-made to the exact porosity and weave which meet your specific requirements . . . **FUMEALL** can be ordered as yardage or as completely fabricated bags of any size and specification.

INDUSTRIAL FABRICS DIVISION

Portland Woolen Mills, Inc.

P.O. Box 2620 • Portland 3, Oregon, U.S.A.

NOW ...greater hoist payload capacity per dollar

MATCHED FOR EXTRA PROFITS
Rugged new St. Paul dump bodies are perfectly "teamed" for maximum output with the new extra capacity St. Paul hoists. They're huskier, tougher.

Check St. Paul before you buy!

Whether you need a single standard duty body hoist, or a fleet of heavy duty twins, you'll get *more payload capacity per dollar, per pound of weight in the new St. Paul line.* This is because St. Paul — pioneer builder of the first hydraulic hoists 40 years ago — has "scooped" the industry again with *over 50 advanced engineering improvements no other hoist can match.* See these great new 5 to 28-ton capacity hoists and matching dump bodies at your St. Paul Distributor today, or write direct for free literature.

The hoist to see in '53!

QUICK FACTS

1. New "center-push" design means easier lifting, reduced hinge loads.
2. New equi-lift strut arms eliminate uneven stresses, prevent binding.
3. New tapered cylinder head reduces mounting height, increases leverage up to 25%.
4. New uni-flex subframe provides more strength with less weight.
5. New friction-free pump assures added power, lower oil pressures.

MAIL COUPON

St. Paul HYDRAULIC

Hoists & Dump Bodies • Refuse Loaders
Truck Petrols • Elevating End Gates

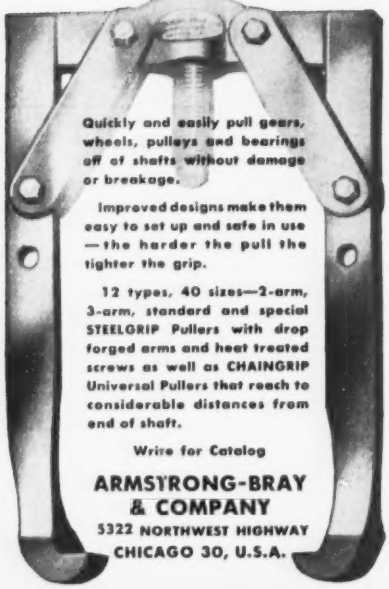
ST. PAUL HYDRAULIC HOIST
Customer Service Department
36121 Main St., WAYNE, MICH.

Send free literature on new St. Paul
☐ Hoists ☐ Dump Bodies

Name _____
Title _____
Employed by _____
Address _____
City _____ State _____

S-HBC-2R

ARMSTRONG-BRAY
GEAR and WHEEL PULLERS



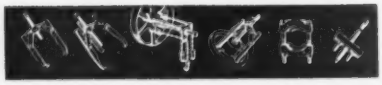
Quickly and easily pull gears, wheels, pulleys and bearings off of shafts without damage or breakage.

Improved designs make them easy to set up and safe in use—the harder the pull the tighter the grip.

12 types, 40 sizes—2-arm, 3-arm, standard and special STEELGRIP Pullers with drop forged arms and heat treated screws as well as CHAINGRIP Universal Pullers that reach to considerable distances from end of shaft.

Write for Catalog

ARMSTRONG-BRAY & COMPANY
5322 NORTHWEST HIGHWAY
CHICAGO 30, U.S.A.



Rotary Positive Gas Pumps
5 cfm to 50,000 cfm.

CENTRIFUGAL BLOWERS AND EXHAUSTERS
single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures.

Rotary Positive Blowers and Exhausters
5 cfm to 50,000 cfm.

Positive Displacement Meters
4,000 cfh to 1,000,000 cfh.

Inert Gas Generators
1,000 cfh to 35,000 cfh.

Cycloidal Vacuum Pumps
500 cfm to 13,000 cfm.

WE *Specialize* IN YOUR PROBLEMS OF MOVING GAS OR AIR!

You may need to move a thimbleful of gas . . . or create a cyclone of whirling air. Whatever your problem, we've probably met something close to it, in experience of almost a century of building such equipment.

Another reason why we know so much about this job is that it's all we do. Our customers range from the "giants of industry" to the neighborhood plant, both of whose production depends upon continuous, reliable, economical performance of air and gas handling units. Because we build the exclusive *dual-ability* line of Rotary Positive and Centrifugal Units, in a wide range of sizes, we offer a *dual choice* which permits completely unbiased recommendations.

So—if you have a problem today—or anticipate one a year or five years from now, we suggest you call upon the facilities of R-C Specialists. Write for bulletins on any specific equipment.

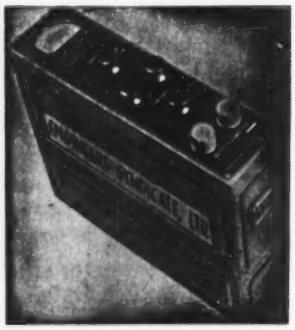
ROOTS-CONNERSVILLE
Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC. • 153 Washington Ave. • Connersville, Indiana

CAN YOU AFFORD TO BE WITHOUT THE

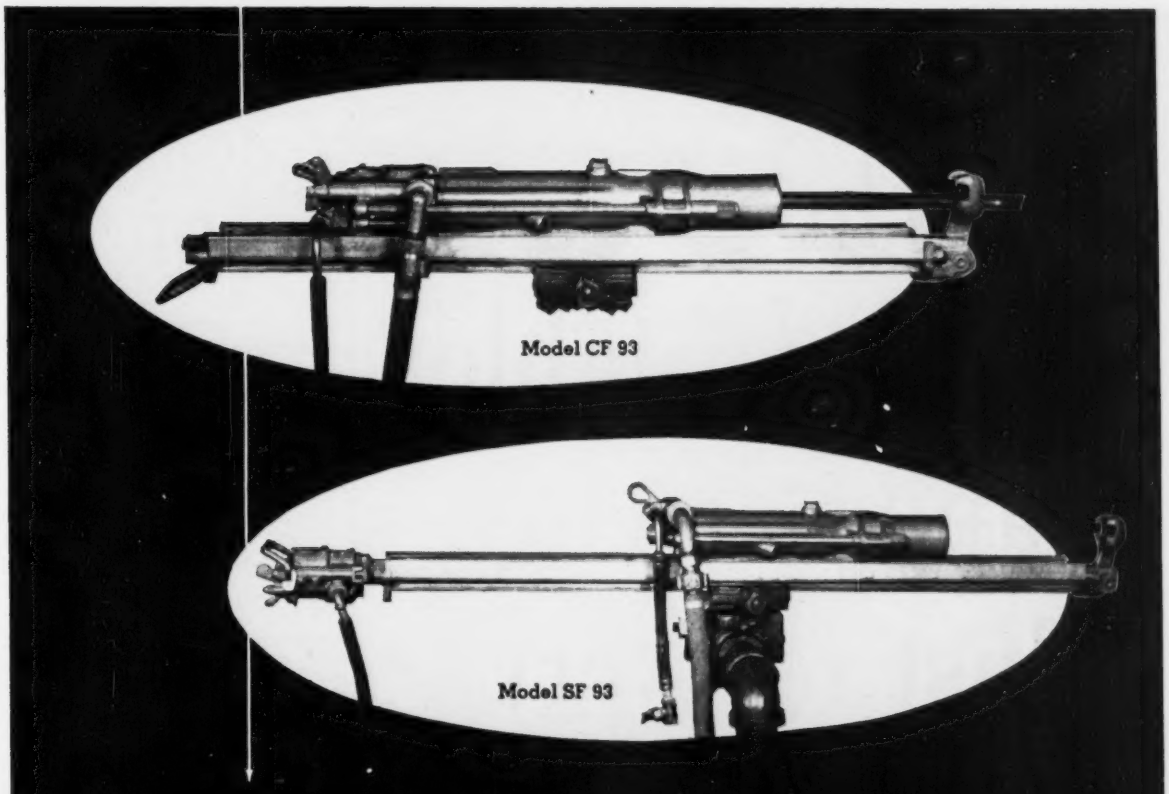
Scintillometer

LOCATE URANIUM 100 TIMES EASIER. THE ONLY PORTABLE GAMMA RAY DETECTOR EMPLOYING CRYSTAL SCINTILLATION. DETECTS ALMOST 100% OF GAMMA RAYS IN COMPARISON TO LESS THAN 1% DETECTED BY THE GEIGER COUNTER.



PORTABLE OR AIRBORNE
ALL TYPES GEIGER COUNTERS;
SPECIAL LONG PROBE COUNTERS
FOR TESTING DRILL HOLES;
ULTRA VIOLET LIGHTS

Engineers Syndicate, Ltd.
The House of Geiger Counters
5011 Hollywood Blvd.
Hollywood 27, California



Introducing the 3½" GARDNER-DENVER 93
...the EAGER DRIFTER!

Equals most 4" machines in *drilling speed.*
Exceeds all other 3½" drills in *hole-cleaning ability.*
Maintains correct bit pressure *automatically* — regardless of ground changes.
Long feed aluminum alloy mounting — with automatic feed motor on drill backhead or on guide shell.
Ask for Bulletin DD-2 — it gives complete specifications.

SINCE 1859 **GARDNER-DENVER**

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
14 Curity Ave., Toronto 13, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Your Management wants to know about ...

The most profitable approach to dust recovery

. . . .

In every industry, from ore to fabric to steel, Buell engineers, working with plant engineers, have established an enviable 18-year record of turning unnecessary dust losses into substantial new profits. What's more, a Buell Dust Recovery System uncovers these additional important advantages: improved product quality, smoother plant-community relations and higher employee morale.

To take advantage of Buell's background and experience in the highly specialized science of Dust Recovery, ask for further information about Buell's **3 basic systems** of dust collection. See how they can help you turn dust into dollars. Send for Buell's new, informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Buell Engineering Company, Dept. 19-A, 70 Pine Street, New York 5, New York.

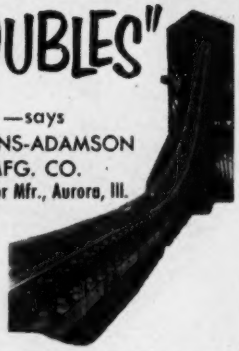
Van Tongeren Cyclone | 'SF' Electric Precipitator | Precipitator-Cyclone Combination | Type 'LR' Collector | Dust Hopper Valves

ELECTRIC CYCLONIC ® buell

ENGINEERED EFFICIENCY IN DUST COLLECTION

"NO MORE LUBRICATION TROUBLES"

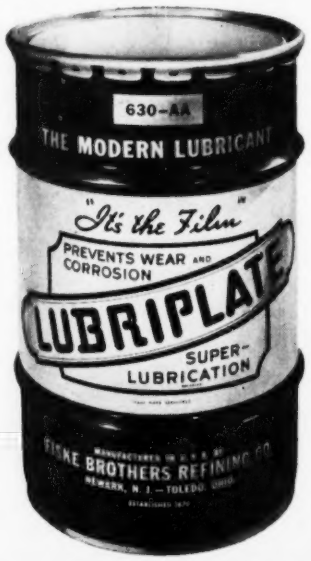
—says STEPHENS-ADAMSON MFG. CO.
Conveyor Mfr., Aurora, Ill.

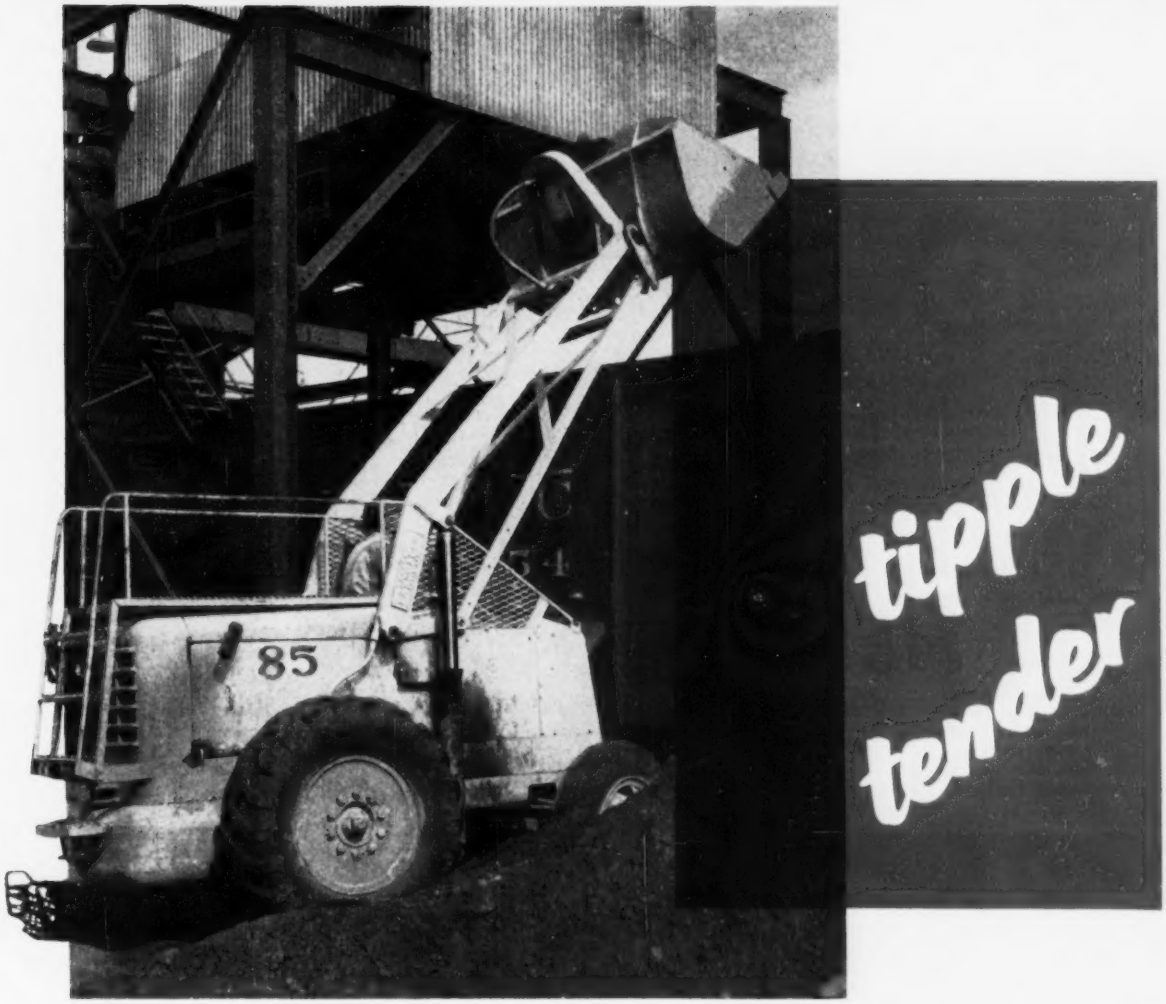


"LUBRIPLATE Lubricants satisfy the 'one-shot' requirements of our conveyor idlers. LUBRIPLATE effectively lubricates each bearing in turn and flows through the hollow shaft to the next bearing. We do not know of a single case of bearing trouble through faulty lubrication where LUBRIPLATE has been used."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.





HUGE tonnages of ore are loaded into cars at this tipple. Cleaning up spillage was a problem before the "PAYLOADER" arrived. Now, equipped with a special tunnelled bucket this agile tractor-shovel straddles each rail and cleans up neatly between and outside of the tracks, piles the ore to one side and then loads it into the cars as they approach the tipple.

This is one of many ways "PAYLOADER" versatility and flexibility is being utilized by the mining industry to lower the cost of producing ore. These unique Hough-built machines are complete integrated tractors-with-shovels, having proper built-in balance and weight distribution, multiple speeds in reverse as well as forward and other outstanding advantages for faster, better, digging, stripping, loading, carrying and dumping. "PAYLOADERS" are available in a wide range of sizes and models up to 1½ cu. yd. bucket capacity — are sold and serviced by a nationwide group or responsible, experienced Distributors. The Frank G. Hough Co., 726 Sunnyside Ave., Libertyville, Illinois.

WRITE for literature on any **PAYLOADER®** tractor-shovel: Model HA — 12 cu. ft.; Model HAH — 15 cu. ft.; Model HE — ½ cu. yd.; Model HF — ¾ cu. yd.; Model HY — 1¼ cu. yd.; 4 wheel drive Model HR — 1 cu. yd. and HM— 1½ cu. yd. There is no obligation.

SAY "HUFF"

PAYLOADER®

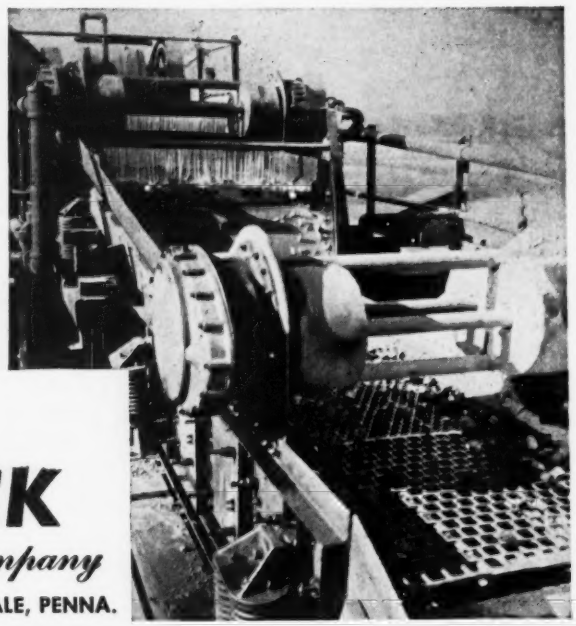
THE FRANK G. HOUGH CO. • Since 1920

Cut your screening costs...

with Hendrick Perforated Plate

Screening costs are greatly reduced by the use of Hendrick Perforated Plate on vibrating and shaking screens because—

- of the exceptionally long service life of Hendrick Perforated Plate.
- product uniformity is assured, since Hendrick Perforated Plate always maintains uniformity of mesh.
- the full clearance of Hendrick Perforated Plate practically obviates clogging.
- of the labor-saving ease and rapidity with which decks can be changed.



Write for a copy of Hendrick Perforated Plate Catalogue

SEE OUR CATALOG IN SWEET'S

HENDRICK

Manufacturing Company

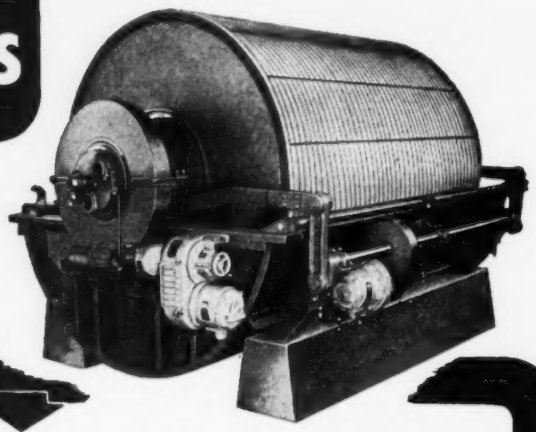
70 DUNDAFF STREET, CARBONDALE, PENNA.

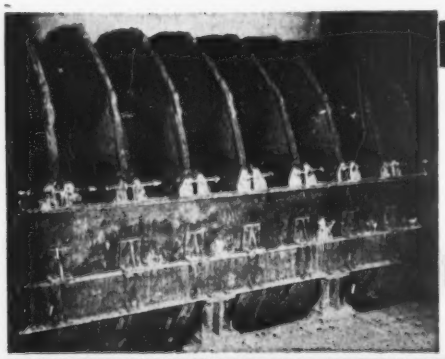
Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Wedge-Slot Screens
Architectural Grilles
Mitco Open Steel Flooring,
Shur-Site Treads, Armorgrids

MORSE CONTINUOUS VACUUM FILTERS

PARAMOUNT IN EFFICIENCY AND MECHANICAL DEPENDABILITY





Dependable for Continuous Duty—Fully Automatic. Morse Drum and Disc Filters are highly regarded for satisfactory performance and low maintenance—made in a wide range of sizes to meet most all requirements.

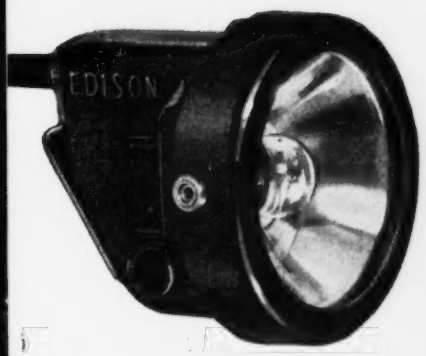
MORSE DISC FILTERS are ideal for filtering more than one character of concentrate or material where separated filtrates are desired.

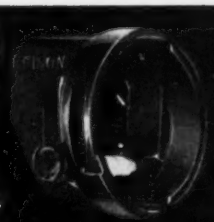
Write for Bulletin No. 4710

MB

MORSE BROS. MACHINERY COMPANY

ESTABLISHED 1898 DENVER, COLORADO, U. S. A. (CABLE MORSE)





HEADPIECE HOUSING

Molded of tough, lightweight bakelite. Designed to direct the light to the job.

DOUBLE FILAMENT BULB

Two filaments of equal light output in one bulb. If one filament burns out, second filament restores full light.

ADJUSTABLE CRADLE

Positive screw control moves bulb cradle for accurate spot-beam focusing.

BEZEL RING AND LOCKS

Sturdy bezel makes tight seal, is easily removed. Contains rubber-cushioned lens. Locks prevent tampering.

EXCLUSIVE NICKEL-IRON-ALKALINE CELLS

Battery does not destroy itself to function; does not deteriorate when not in use. Welded steel containers enclose the cells and the entire battery is encased in a high-strength, non-combustible, corrosion and impact resistant molded nylon case. The valve block is one-piece nylon construction; easily removed. All exterior metal parts are stainless steel. Rugged hood contains dependable magnetic lock device.

THE EDISON R-4

. . . is worth looking into

Convincing testimony that QUALITY COUNTS in underground illumination is provided by the world-wide acceptance of the Edison Electric Cap Lamp.

Designed from a thorough knowledge of overall mining problems, the Edison R-4, made up of compact, easily handled sub-assemblies, has the QUALITY features that keep a brilliant, unfailing beam on the job, shift-after-shift, for years.

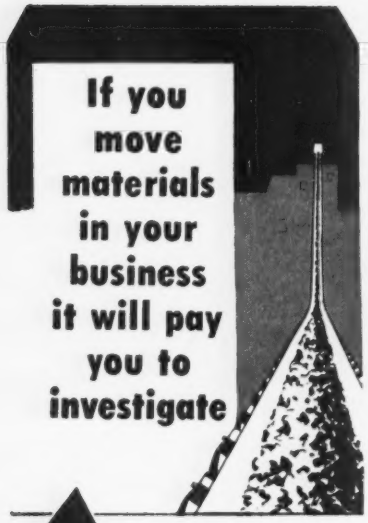
We'll be glad to show you how this EDISON R-4 QUALITY can put new peaks on your production records, safely.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY
Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.
At Your Service:
69 Branch Offices in the United States & Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED
Toronto, Montreal, Calgary, Winnipeg,
Vancouver, New Glasgow, N.S.



If you move materials in your business it will pay you to investigate

BG PRE-ENGINEERED STANDARDIZED BELT CONVEYORS

see your B-G distributor or write

Barber-Greene

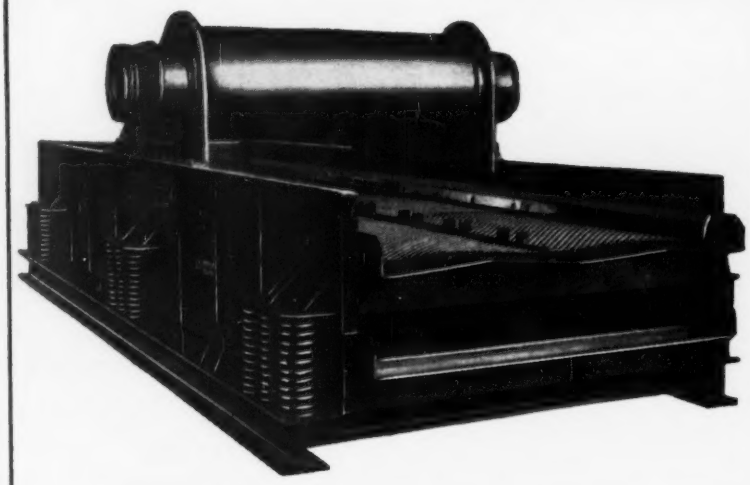
AURORA, ILLINOIS, U. S. A.

His business paper . . . of course

No man who takes his job seriously takes his business paper lightly. The **Best Informed Men in your Field** read every issue . . . straight through. They can't afford not to. Matter of fact, who can? You *need* the continuous touch with facts, news and "how-to" that only your business paper provides. Cover-to-cover reading makes *you* one of the **Best Informed Men in your field,** too.

Engineering and Mining Journal

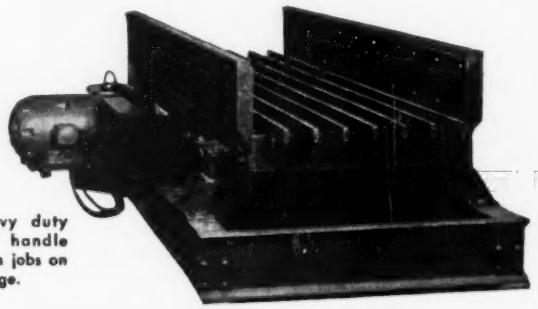
One of a series of ads prepared by THE ASSOCIATED BUSINESS PUBLICATIONS



SIMPLICITY gyrating screens are doing a fast, efficient sizing and dewatering job for the metal mining industry

The 6' x 20' Simplicity Model OM Double Deck Screen shown here is typical of Simplicity Screens used successfully at the great Mesabi Range in Minnesota to size and dewater iron ore. This screen, with a ⅜" opening on the top deck and a 1½mm. dewatering surface on the lower deck, is designed for heavy media concentration of iron ore.

Throughout the metal mining industry, Simplicity equipment is handling all types of preparation work from coarse scalping to fine screening and dewatering. Simplicity operating mechanism insures fast, accurate sizing and keeps production costs down.



Simplicity heavy duty scalpers also handle tough production jobs on the Mesabi Range.

Simplicity

TRADE MARK REGISTERED

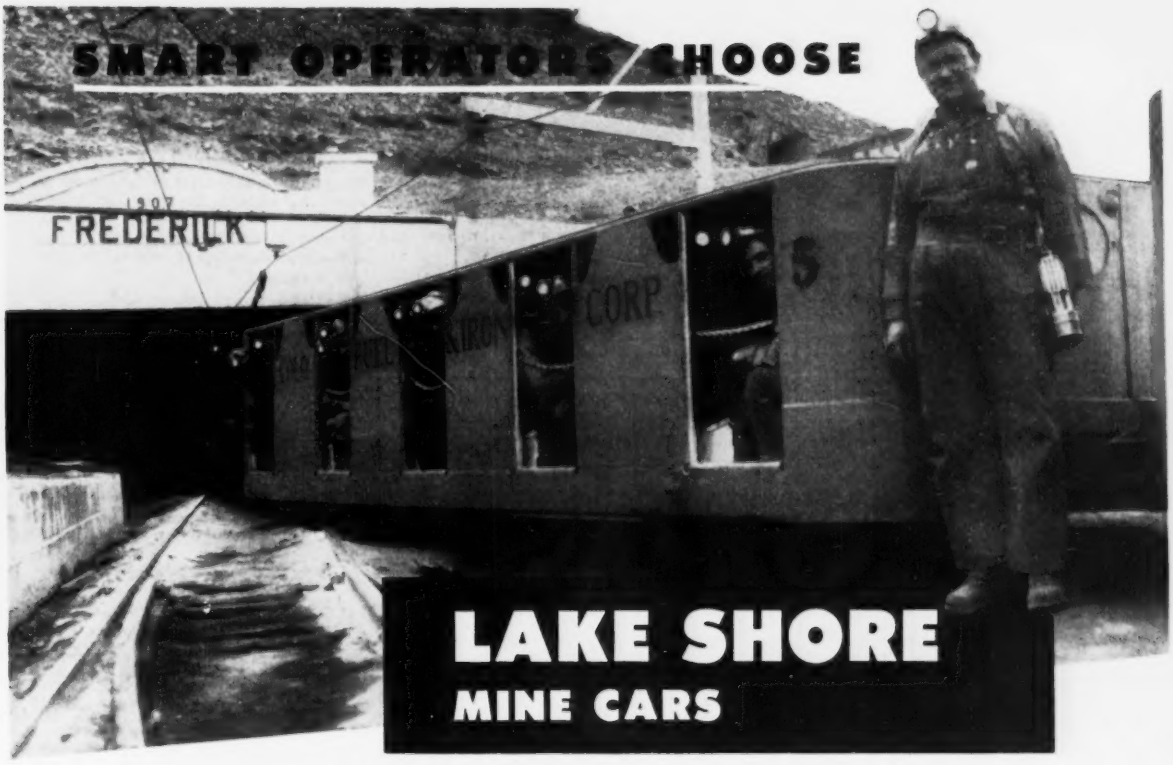
ENGINEERING CO. • DURAND, MICHIGAN

Sales representatives in all parts of the U.S.A.

FOR CANADA: Canadian Bridge Engineering Co., Ltd., Walkerville, Ontario

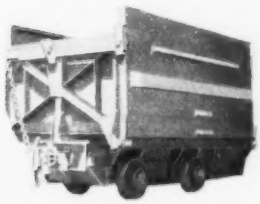
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

113



for a safe, smooth ride . . .

THAT'S what this Lake Shore Man Haul car (above) gives 30 men . . . a dry, safe, comfortable, upright ride with plenty of knee and headroom — space on the seats for dinner boxes. Enclosed design gives men full protection. Available insulated against electricity. Car equipped with full universal oscillating trucks, or conventional type.



for heavy loads and rough service . . .

250 cubic feet — the capacity of this tough, all-welded Lake Shore Granby type side dump car . . . designed for the extremely hard loading and operating conditions met in modern, high-production mining.

a standard of reliability . . .

This 38 cubic foot Lake Shore Standard side dump car has given years of trouble-free service in mines all over the country. Time-tested, simple, sturdy design.

Write for more information on Lake Shore "job-proven" Mine Cars and Mine Equipment.

Standard and Special
Mining-Milling Machinery for Every Application.

LOHED MINE CARS

JETO BOTTOM DUMP SKIP

BICYCLE SHEAVES

LAKE SHORE Engineering Company
IRON MOUNTAIN MICHIGAN

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

$1.20 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)
POSITION WANTED and Individual Selling Opportunity undisplayed rate is one half of above rate, payable in advance.
PROPOSALS, $1.20 cents a line an insertion.

INFORMATION:

BOX NUMBERS count one additional line in undisplayed ads.
DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENT Address N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. For February Issue closing January 15th.

ASSISTANT OFFICE ENGINEER

Recent electrical engineering graduate with some practical experience in office work and procedure, for work large Copper Company Chile, South America. 3-year contract.

FIELD ELECTRICAL ENGINEER

Whose duties would be to supervise the work done by the District Electrical Foreman in the various camps. This applies to the Plant with its auxiliary services and covers power distribution and utilization. but in general not power generation or transmission, large copper company Chile, South America. 3-year contract.

Transportation both ways and salary while traveling paid by Company.

In reply give complete details.

P6066 Engineering & Mining Journal
330 W. 42nd St., New York 36, N. Y.

WANTED — CHIEF CHEMIST:

Age 35-40. Experienced in up-to-date laboratory handling of good volume of miscellaneous analyses and assays of ores, concentrates and mill products at large copper mill Mediterranean area.

Duties—supervise, train and check native technicians in modern methods and organize efficient routines. Strong company. Three year contract. Excellent living conditions. Submit record education, experience & references. Photograph optional. Salary open.

P 5977 Engineering & Mining Journal
1111 Wilshire Blvd., Los Angeles 17, Calif.

FOR ROME ITALY

2 Mineral Geologists $12,500
10 Years experience in all metals.
1 Water Geologist $11,500
find water, drill wells—Turkey.
All expenses pd. Yr to Yr contract.
Single Men Only.

J. L. Overholt Wabash 2-5020
WABASH EMPLOYMENT AGENCY
202 S. State Chicago, Ill.

OPEN PIT MINING

Contractor with excellent equipment and experienced personnel interested in excavating, material handling, or open pit mining work.

CW1319 — Engineering & Mining Journal
330 W. 42nd St., New York 18, N. Y.

We Specialize in Buying Complete Mining, Milling or Construction Plants

We have purchased 14 within three years. Please contact us before you sell.

BO 5701 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

GENERAL SUPERINTENDENT, iron mining company operating in Lake Superior district. Experience open pit and underground operation, as well as beneficiation, required. Reply should state complete educational qualifications and operating experience as well as personal and family statistics. Salary open pending interview. P-6226, Engineering & Mining Journal.

WANTED — METALLURGICAL Engineer to conduct test work preliminary to operation of a large copper-zinc reduction plant. Broad experience essential in Roasting, Leaching and Zinc Electrolysis. To the right man a large Eastern Canadian mining organization will offer an attractive salary. Apply to P-6302, Engineering & Mining Journal.

WANTED — THOROUGHLY experienced Mechanical-Electrical Superintendent with mining-milling plant experience to take charge of departments for established operating Canadian mining company. In reply give details as to age, education, experience and family status. P-6341, Engineering & Mining Journal.

POSITIONS WANTED

EXPERIENCED MINE staff comprising manager, mine sup't, mill sup't, foreman, accountant, warehouseman, timekeeper and others, available employment. Excellent operating record. Details and references upon request. Apply PW-6260, Engineering & Mining Journal.

GEOLOGIST & MINING Engineer—36. Specializing in exploration and development programs. Will contract geophysical surveys or appraisals. New Era Mines, 1290 Birch Street, Denver 7, Colorado.

MINING ENGINEER. Canadian. Broad experience management and consulting, base metals and gold. Age 39, married. Seeks executive position with mining company. PW-6291, Engineering & Mining Journal.

MINING ENGINEER. Experienced exploration, development and operation underground and open cut, heavy construction and stripping, technical reports. Employed, married, 49, PW-6423, Engineering & Mining Journal.

DIAMOND DRILL CONTRACTORS

Foreign & Domestic

Estimates on Request

Call on *New World Exploration* for core and non-core diamond drilling.

Mineral Deposits
Dam and Bridge Foundations
Grout Holes

For complete exploration service consult us on

Geology Geophysics

NEW WORLD EXPLORATION
Box 1206 Reno, Nevada

DYER'S OIL LEASE TRADER

IS Free. Contains listings on 78 different leases in western states—leases $100 and up for 40 acres. Large drilling blocks available. Write, phone or call

F. W. DYER
1835 Champa St. Cherry 3576
DENVER 2, COLORADO

WANTED INDUSTRIAL PLANTS

Will arrange thru purchase of (1) capital stock, (2) Assets, (3) Machinery and equipment, whole or in part—Personnel usually retained, strict confidence. Box 1351 Church Street Station, New York 8, N. Y.

WANTED UP TO 450 TON MILL OR MILLS

Will require some Flotation Equipment.
W6332 Engineering & Mining Journal
68 Post St., San Francisco 4, Calif.

BUYERS OF SURPLUS COPPER, INSULATED WIRES AND CABLES
No lengths too long or too short.
Telephone: EAstgate 7-4778
PIERCE CABLE CO.
2674 Clyburn Ave., Chicago 20, Ill.

WANTED DOUBLE DRUM HOISTS

Require several large double drum hoists, with electrical equipment. Please send all details.
W-5719 Engineering & Mining Journal
68 Post St. San Francisco, Calif.

IF THERE IS

Anything you want

that other readers of this paper can supply

OR—

Something you don't want

that other readers can use, advertise it in the

Searchlight Section

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

LOCOMOTIVES

1—2-2½ ton Whitcomb Battery, 24" gauge
1—2½ ton Jeffrey battery or trolley, 36" gauge
1—3½ ton Mancha battery, 25" gauge, with 2 sets Edison batteries and charging set
1—4 ton Ironton battery, 36" gauge
2—7 ton General Electric permissible battery, 36" gauge
1—7 ton Atlas battery, 36" gauge
3—8 ton Ironton battery, 36" gauge
2—8 ton General Electric battery, 36" gauge
4—10 ton Atlas battery, 36" gauge
1—4½ ton Goodman trolley, 36" gauge
1—5 ton Jeffrey trolley, 36" gauge
1—6 ton Goodman trolley, 36" gauge
2—8 ton Goodman trolley, 36" gauge

FLOTATION MACHINES

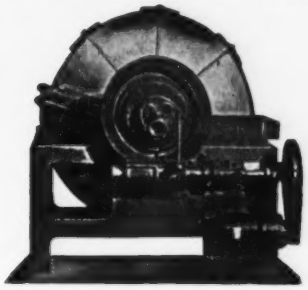
1—New Morse Jetair #7 Hydra-cell
1—New Morse Jetair 2 cell #7
1—Fagregan Single cell
1—6 cell 18" Stearns-Roger
1—6 cell Denver "Sub A" #18
1—6 cell Denver "Sub A" #21

HOISTS—ELECTRIC

1—10 HP Vulcan #0 Single Drum
1—15 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Single Drum
1—3 HP Vulcan Double Drum
1—3 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP H&B Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum

THICKENERS

1—12' Dorr lowhead thickener with 10' deep redwood tank
1—24' Dorr lowhead thickener with 12' redwood tank



FILTERS

1—4' Single Disc Oliver Filter
1—6' 2-disc American Filter
1—6' 3-disc American Filter
1—4' x 2' Dorreo Filter
1—4' x 6' Morse Drum Filter
1—18" Morse Round Pattern Filter Press
1—36" Merrill Triangular Filter Press
1—#12 Sweetland Filter Press, 36 leaves.

JAW CRUSHERS

2—9" x 14" Universal, #3M
1—9" x 15" Wheeling
1—9" x 15" Farrell
1—9" x 16" Universal
1—8" x 24" Rogers
1—8" x 36" Universal
1—11" x 18" Universal
1—24" x 13" Farrell

BALL & ROD MILLS

1—4' x 4' Standard Ball Mill
2—6' x 48" Hardinge Conical Ball Mills with air swept equipment.
1—8' x 22" Hardinge Conical Pebble Mill
1—3' x 8' Marcy Rod Mill

CONE CRUSHERS

1—3' Symons Cone Crusher
1—4' Symons Cone Crusher

CLASSIFIERS

1—48" x 15' Dorr Multizone Classifier
1—48" x 18' Akins Spiral Classifier
1—40" x 20' Morse Spiral Classifier

BALANCES

1—200 oz. Troemner bullion and specie balance
1—#045 Ainsworth 1 gram assay balance
1—Becker button balance, sensibility 1/50 mg.
1—Keller assay balance, inverted beam, sensibility 1/100 mg.
1—Smith & Thompson assay balance, sensibility .005 mg.
1—Thompson #7 button balance, sensibility 1/200 mg.
1—5000 oz. Fairbanks & Hutchinson bullion balance

BLOWERS & EXHAUSTERS

2—#8H 42 Jeffrey Aerodyne mine fans
8—Jeffrey Aerodyne Midget Exhausters, permissible
4—Jeffrey #61 Exhausters with 3 HP motors
1—Connus Ventair blower, Type T, Size 4
3—#250 D.F.C. Furnace Blowers
4—American Type HS New Blowers, 12000 CFM with 2 speed motors.

CONCENTRATING TABLES

4—Wilfley #6 Tables
21—Deister "Plat-O" Tables

CONDITIONERS

1—5' x 5' Deco Conditioner with redwood tank
2—7' x 7' Morse Conditioners
4—8' x 8' Morse Conditioners
4—10' x 10' Morse Conditioners

Send for Catalog 521E

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. P.O. Box 1708 Keystone 5261 DENVER, COLORADO

FOR SALE

Rotary Kiln—Vulcan Iron Works—8' dia. x 80' long, Feed Hood, Combustion Chamber, Oil Burner and Controls, and other auxiliaries. Variable Speed Drive.

Ball Mill—Hardinge Conical 10' x 48", 2200/4400 V 400 HP Motor, Reverse Loop Classifier, Blower and Separator, Vent Dust Collector.

Sample Mill—Includes Allis Chalmers Type R 222 Crusher; Aerovibe Screen & Roll Crusher, (2) Geary Jennings Samplers, Bucket Elevators, Chutes, etc.

Thickeners—Dorr Type A with Steel Tanks, (3) 26' x 10', (1) 24' x 10', (1) 12' x 8'.

Descriptive list of other Chemical & Metallurgical equipment furnished upon request.

THE VULCAN DETINNING COMPANY

SEWAREN, NEW JERSEY

Bucyrus-Monighan 1150B 25-yd. elec. Walking dragline, 180' boom, 1949. Also diesel 9W, 7W, 3W.
Diesel-elec. 30" hydraulic dredge, 1951.
Locomotives, 3 to 80 tons, diesel gas.
Marion 18-yd. electric stripping shovel.
Bucyrus 120B 4½-yd. 25 cycle elec. shovel.
Marion elec. 7½-yd. & 3½-yd. diesel shovels.
Telsmith 25A gyratory crusher; 42" A-C.
Nordberg 875 KW diesel generator set, 1250 HP.

H. Y. SMITH CO., 828 N. B'way, Milw. 2, Wis.

MOTOR GENERATOR SETS

	3,000 KW,	G.E., Synch.,	250 volt DC,	13800 volt AC
	1,000 KW,	A.C., Synch.,	250 volt DC,	4150 volt AC
	250 KW,	C.W., Synch	250 volt DC,	220/440 volt AC
	200 KW,	A.C.,	275/300 volt DC,	2300 volt AC
	150 KW,	West., Synch.,	250 volt DC,	2400 volt AC
(2)	150 KW,	West., Synch.,	125 volt DC,	220/440 volt AC
(2)	125 KW,	G.E., Synch.,	250 volt DC,	2400 volt AC
	100 KW,	Delco, Synch.,	250 volt DC,	2300 volt AC

SYNCHRONOUS MOTORS

HP	MAKE	TYPE	SPEED
475	West.		720
300	G.E.	ATI	900
200	West.(2)		900
180	G.E.	ATI	900
150	G.E.	TS-963	1200
150	G.E.	TS-965S	720

SLIPRING MOTORS

HP	MAKE	TYPE	SPEED
600	C.W.	131-AQ	507
500	G.E.(2)	IM	450
400	G.E.	IEM-17B	870
250	G.E.	IM-17B	450
200	G.E.	MT-559Y	1175
150	G.E.	IM	870

230 V. D.C. MOTORS

HP	MAKE	TYPE	SPEED
300	G.E.(3)	MPC	500
250/200	Rel.	2600T	400/800
200/130	C.W.	CMC-125H	450/900
187½	G.E.	MDS-418AR	435
150	West.	SK	1150
150	West.	SK	850
150	G.E.	LC	1750
125	Rel.	T	600

L. J. LAND, INC.

STONY CREEK MILLS
READING, PA.
TELEPHONE 4-4953

FOR SALE OR RENT—Rebuilt and Guaranteed
BUCYRUS-ERIE, MODEL 44-B, CRAWLER COMBINATION SHOVEL AND CRANE

2 yd. Shovel Attachment with Dipper Stick
2 yd. Owen Clamshell Bucket
70 ft. Boom with Tag Line Winder
Powered by Buda Diesel Engine
Completely Rebuilt from Ground Up by Dempster Brothers, Inc.
Can Be Inspected at Knoxville, Tennessee
Ready for Operation—This is a Real Buy.

GLAZER STEEL CORPORATION

2100 Ailor Avenue Phone 4-8601 Knoxville, Tennessee

FLOT MACHINES

1—2-Cell No. 15 Denver "Sub A"—Wood Tank

1—8-Cell No. 24 Denver "Sub A"—Wood Tank

CONVEYORS

1—18" x 35' long, complete with belt and motor

1—14" x 11' long Belt Feeder, on steel channels

1—18" dia. x 26" face Ding's Mag. Pulley, with mechanism, belt & charger

CRUSHERS — JAW

1— 6 x 12 Wheeling

1—10 x 20 Allis-Chalmers

1— 9 x 40 Austin-Western

MISCELLANEOUS

1—30" x 48" Baker Ball Mill

1—Butchart Concentrating Table

1—3" Dorrco Duplex Diaphragm Pump, with gear motor

1—12" x 5" Denver Lab. Batch Ball Mill — Motorized

1—20' x 10' Thickener — Wood Tank

1—32" x 16" F.M. Davis Crushing Roll

2—16 Cu. Ft. Ore Cars

1—20 H.P. Upright Boiler

2—7½ Ton Goodman Trolley Locos. 36" Ga. New & Used Wire Rope

Starting Compensators from 7½ to 15 H.P.

Motors from ¼ H.P. to 50 H.P.

1—2" Jaeger Pump direct connected to Gas Engine

WRITE FOR STOCK LIST No. 12

FLORENCE MACHINERY & SUPPLY CO.

Suite 904 Equitable Bldg. **Denver 2, Colo.**

OVERHEAD ELECTRIC TRAVELING CRANE: Shepard Niles 7½ ton, 80' span, 4 motor, bucket operating, cage control, 440 volt, A.C., with or without 2½ yd. bucket. Now operating, available January 1953, excellent condition.

CLAM SHELL BUCKETS: Blaw Knox 2½ yd., model W730, weight 6200 lbs., material handling type. Also, one Hayward class E, 2½ yd. Both offered with or without new spare parts.

LOCOMOTIVE CRANE: Link Belt 25 ton, std. R.R. gauge, gasoline powered, air brakes, cast steel trucks, bucket handling, with 1¼ yd. clam shell, thoroughly modern, excellent condition. Located Minnesota. For Sale or Rent.

PULVERIZERS: Hardinge steel lined Conical Ball Mills, complete with motors and auxiliary equipment for dry grinding, sizes 5' x 22", 10' x 36", 10' x 4'. Eimco Ball Mill, size 3' x 4', complete, NEW, UNUSED. Marcy Rod Mill, 8' x 12' and one 5' x 14', manganese lined, with motors and drives.

CRUSHERS, JAW: Sizes 12" x 15" to 48" x 60".

CRUSHER, ROLL: Traylor 18" x 42", heavy duty.

CRUSHER SPECIAL: Pioneer 30" x 42", all steel, roller bearings, condition like NEW.

CRUSHING PLANT: Cedar Rapids, portable, 2 unit type, capacity 40 yds. per hour.

MINE HOISTS: 1—Vulcan single drum 3' dia., 2'6" face, 75 H.P., 220 volt, NEW condition. 1—150 H.P., 6'6" dia., 6'8" face. 1—Vulcan double drum 200 H.P., 8' dia., 4' face, one drum clutched. 1—200 H.P., 72" dia., 48" face, single drum. All 3 phase, 60 cycle, 2200 volt, with control equipment.
Head Frame for double shaft 16'9" x 17'2", height 55 ft., with or without 8 ft. dia. sheaves for 1½" rope.
Other Hoists 100 H.P. to 1050 H.P., single and double drum with electrical equipment.

PUMP: Allis-Chalmers centrifugal, type MJ-4, 8" x 6", 4 stage, 1400 GPM, 1200 ft. head, with G.E. 600 H.P. motor and control.

We Buy and Sell Equipment Throughout North and Central America.

A. J. O'NEILL

LANSDOWNE, PA.

Phila. Phones: MAdison 3-8300 — 3-8301

1—800, 1100 & 1500 Barrel Cement Plants—Complete lime hydrating plant
1—24 & 5 roll Raymond mills.
Rotary Dryers—4' x 30'—6' x 40'—5' x 50'
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 20'.
Fuller-Lehigh Mills—22"—47" & 52"—Bradley Mills.
Jaw Crushers—From 10" x 6" up to 38" x 24".
Crushing Rolls—From 12' x 24" up to 54" x 24".
Sturtevant Rotary fine crushers—No. 0—No. 1—No. 1½ and No. 2.
Ring Roll Mills—Sturtevant No. 1—No. 2 duplex.
15'—16' & 18' Hereschoff furnaces.
Gyratory crushers, No. 3 to No. 12.
5'—8'—10'—14' & 16' — Air separators
Magnetic separators—Jigs—screens—classifiers and thickeners and air separators.
4'—5'—6' & 7' dia. Rod Mills. Mine Hoists.
6' x 4'—8' x 12' Rotary Filters.
1'—6' Raymond "Whizzer" Separator.
New Dryers Kilns & Dust Collectors.
6"—10"—14"—18"—30" McCully Superior gyratory crushers.

W. P. HEINEKEN, INC.
50 Broad Street, New York

Season's Greetings

DUMP CARS—2 yd. Roller Brng. 36" ga.
PULVERIZERS—Sturtevant Ring Roll #1, Wms. LG 1, Reg. #1, GA 30, Hammer
SCREENS—Tyler, 3x5, w/1/2/3 decks.
ROTARY KILNS—3x16, 4x30, 5x40, 6x80
JAW CRUSHERS—8x14, 11x22, 24x36
BUCKET—2 yd. Wms. Clamshell
SCREW CONVEYOR—14" NEW 50'
PRESSURE BLOWER — Spencer 1200 & 4000 cfm.
HARDINGE MILLS — 7' x 48", 8' x 22" w/ motors.

LAWLER COMPANY

Durham Ave. **Metuchen, N. J.**
Metuchen 6-0245 N. J.

Excellent

DORR BOWL CLASSIFIER

Size 12' x 30' x 14'. Attractively priced.

Roger Pierce Equipment Sales Company
808 Newhouse Building
Salt Lake City, Utah

RELAYING RAIL

All Sizes

Track Accessories

LEFTON INDUSTRIAL CORP.
***Genl. Office:* 212 Victor St.**
St. Louis 4, Mo.

CARLYLE

INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR STEAM AND WELDING HOSE

WHY WAIT

We have 8 to 48

RUBBER CONVEYOR BELTING

TOUGHCOVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.
STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.
FLEXIBILITY — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily runs true on all idlers, gauge resistant, excellent for long and short hauls and slope installations.

Avoid delays in your production schedules!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

INQUIRE FOR SIZES NOT LISTED. ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

All our belting made by the leading belting manufacturers.

Write for Free Booklet on Installation, Care & Maintenance of Conveyor Belting.

SEND US YOUR INQUIRIES FOR OTHER RUBBER PRODUCTS

CARLYLE RUBBER CO., Inc.
62-66 Park Place, New York 7, N. Y.
Phone: Digby 9-3810

MACHINERY

Crusher (brand new) 24x12 Allis-Ch.
Crusher 15x30 Blake type
Crusher 2 ft. Symons cone
Ball Mill #64½ Marcy; new liners
Mine Hoist 75 hp Vulcan 1-drum 440 volts

PAUL F. SMITH
39 W. Adams St. • **Phoenix, Arizona**

FOR SALE

Gas Generating Unit

500,000 cu. ft. Holder
5 Gas Generators
5 Igniters, 10 Ash Cars
5 Washboxes
3 Blast & 2 Gas Blowers
Automatic Controls
Lubricators, Pumps
Scrubbers, Etc.

Eastern Kentucky Scrap Co., Inc.
P.O. Box 388 **Louisville, Kentucky**

MOTORS—M. G. SETS—TRANSFORMERS

ENGINEERED AND REBUILT BY EXPERTS IN OUR OWN PLANT

SYNCHRONOUS MOTORS

Qu.	H.P.	Make	P.F.	Volts	R.P.M.
1	6000	G.E.	100	2300	90
1	3000	Whse.	80	4800/2400	720
2	2100	G.E.	100	2300	360
2	1750	G.E.	100	2300	3600
1	750	G.E.	80	2300	450
1	600	G.E.	100	440	360
1	700	G.E.	80	2300	720
1	250	G.E.	100	2300	514
1	200	Whse.	80	440	1200
1	187	G.E.	80	440	720
1	150	G.E.	100	2200	900
1	150	G.E.	100	550	600
1	120	G.E.	80	550	450
2	135	G.E.	80	4000/2200	1200
3	125	El. Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440	1800
1	100	Ideal	80	440	900
2	100	G.E.	80	440	600

With these we can supply—Manual, Semi on full magnetic reduced or full voltage control

SQUIRREL CAGE MOTORS

3-Phase — 60 Cycle

Qu.	H.P.	Make	P.F.	Volts	R.P.M.
1	400	Cont.	NZ-806	2300	1200
1	400	G.E.	I-K	2200	v514
1	400	G.E.	KT-412	2200	450
1	300	Whse.	CS-890	2300	1780
1	200	Whse.	CS-873-C	2200	1200
1	200	Al.Ch.	ARY	440	600
2	125	Al.Ch.	AR	2200	1750
1	125	Al.Ch.	AR	2300	514
1	125	C.W.	126-Q	440	430
2	100	Whse.	CS-663-C	440	1750
1	100	Al.Ch.	AR	550	720
1	100	Whse.	CS-938	2200	514
1	100	F.M.	H-241	440	450
2	75	Al.Ch.	AR	2200	1705
1	78	G.E.	I-K	440	690
1	75	Al.Ch.	AR	2200	720

Special—1 (new) G.E. Vertical KF-574, 2200-Volt 580 R.P.M., enclosed, hollow shaft.

MOTOR GENERATOR SETS

Qu.	KW	Make	RPM	Volts DC	Volts AC
1(3-U)	24.80	Whse.	720	600	2400/4800
2	1500	G.E.	600	600	4150/2300
3	1000	Whse.	514	600	11000/6600
4	1000	G.E.	514	600	11000/6600
1	1000	G.E.	514	600	2300
2	500	C.W.	720	575	2300/440
1	400	C.W.	1200	125/250	440/2300
2	250	Whse.	1200	125/250	2300
1	200	Ridgway	900	275	2300
2	200	Whse.	1200	125/250	440
1	155	G.E.	720	250	2300/440
2	150	Whse.	1200	250	2300
1	100	Al. Ch.	1200	125/250	4000/2300
1	100	Delco	1200	125/250	440/220
1	100	Ridgway	1200	275	4000/2300
1	100	C.W.	1200	125	440/220
1	85	C.W.	1200	250	440/220
1	75	Al. Ch	900	250	2300
1	75	Whse.	900	75	2300
1	25	Ideal	1750	125	220
1	25	Al. Ch.	1200	250	440/220
1	20	Al. Ch.	1200	250	440/220
3	15	Al. Ch.	1200	250	440/220

We can furnish any of these sets with exciters and VARIABLE VOLTAGE CONTROLS engineered and rebuilt to your requirements.

TRANSFORMERS

Qu.	KVA	Make	Type	Phase	Voltage
1	2750	G.E.	H	3	13,800-2400/4160Y

This now being completely rewound with (2) 2½% taps above and below on 13,800 side.

3	250	Packard A		1	13,200-2200
3	150	Packard A		1	2300-230/460
3	100	G.E.	H	1	33,000-2300
3	25	G.E.	H	1	2400-120/240
40(new)	3	Al. Ch.	OISC	1	2400-120/240

Motor Generators of modern design, complete with control — still on their original foundations — available for immediate shipment.

SLIP RING MOTORS—CONSTANT DUTY

3-Phase — 60 Cycle

Qu.	H.P.	Make	Type	Volts	R.P.M.
1	1800	G.E.	MT 498	2300	357
1	1200	G.E.	MT 26	2200	277
2	1000	Al.Ch.	ANY	2200	235
1	800	G.E.	MT	2200	440
1	700	Whse.	CW	2300	720
1	600	G.E.	MT 20	2300	360
1	500	Al.Ch.	ANY	2200	514
2	500	G.E.	I-16-M	2300	450
1	400	G.E.	MT 412	2300	440
1	250	Whse.	CW 937	440	1200
1	250	Al.Ch.	ANY	440	720
1	250	G.E.	MT 414	2200	300
1	125	Whse.	CW 870	2200	900
1	100	Whse.	CW 766	440	1200
1	100	F.M.	H 20 C	440	900
2	100	G.E.	I-15A-M	2300	514

DIRECT CURRENT MOTORS

Qu.	H.P.	Make	Type	R.P.M.
1***	3000	Whse.	Encl. (Rev.)	600
1***	2400	Whse.	Encl. (Rev.)	600
4***	1500	Whse.	Encl. (Rev.)	600
4***	1200	Whse.	Encl. (Rev.)	600
4***	800	Whse.	Encl. (Rev.)	600
1	350	G.E.	CD-169-A	1150
1	200/250	El. Dy.	No. 22	400/1200
1	250	G.E.	MPC	325/975
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	180	G.E.	MPC	400
1***	125	Whse.	SK-190	600
2	125	Whse.	SK-184	575/850
1	90/160	G.E.	MPC	625/1125
1	100	Rel.	1050L	400/1200

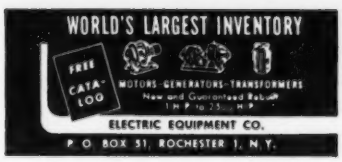
All above 230-VDC except where marked***

***—Pedestal bearing mill design 525/600-VDC

Rev.—designed for mill reversing service.

T. B. MAC CABE COMPANY

4310 CLARISSA STREET — Phone DAvenport 4-8300 — PHILADELPHIA 40, PENNA.



Your inquiry will have special value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertiser wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

FOR SALE

2—Mack—C-41—1947
41 Passenger with Rebuilt Motors, Also Extra Motor and Transmission
6—ACF—IC—41—1947
41 Passenger
EXCELLENT CONDITION

FRANK M. JUDGE
& COMPANY, Inc.
7010 Empire State Building
New York 1, N. Y.
LO. 5-7372-3

FOR SALE

Model 4500 Manitowoc Draglines, caterpillar-mounted, with 140' booms, buckets, Caterpillar engines, 5 cu. yd. 100-ton capacity, one and two years old.

Model 3500 Manitowoc Speedcrane. Lift-crane, clamshell, dragline combination, 2-½ cu. yd. 60-ton capacity, new October, 1950.

Model 802 Koehring Liftcrane, Clamshell, Dragline combination, 2 cu. yd. 50-ton capacity.

All located in Florida. Reply to

FS 5845 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

16 SURPLUS NEW BELT CONVEYORS
36 INCH 1-160' — 2-250' — 1-320' — 1-400' 1-590' — 2-1000' & 1-1600' Long.
42 INCH 1-144' — 1-290' — 1-377' — 1-575' 2-700' — 1-800' & 2-1500' Long.

10 SURPLUS MERRICK E WEIGHTOMETERS
For 24" — 36" & 42" Belt.

REDUCTION CRUSHERS
3 Ft. Traylor TY Gyratory
#530-R Allis Chalmers Gyratory

AIR COMPRESSORS
9 Electric 5,000, 3,865, 3,178, 2,200, 1,578 & 1,302 1090, 678 & 500 Ft.
6 Diesel 1,578, 1,000, 678 & 500 Ft.

LOCOMOTIVES
8 Goodman 4 ton - 8 ton Battery Locomotives.
12 Diesel 100, 80, 65, 45, 30, 20 Ton Locomotives.
22 Gas, 35, 25, 16, 12, 8 & 6 Ton Locomotives.

R. R. CARS
100 Dump Cars 2, 4, 12, 20 and 30 Yd.
100—60 Ton Flat Cars 66—50-Ton Gondolas.
150—8,000 & 10,000 Gal. Cap. Tank Cars

TUNNEL MUCKERS—LOADERS
4 Gardner Denver GD9 & GD14.
10 Eimco 40 & 12B & 21, 4 Sullivan HL20.

LARGE JAW CRUSHERS
7—60x84", 42x48", 36x42", 24x36" & 48x60".

ROTARY DRYERS AND KILNS
4'x20', 4'x45', 8'x33' & 7'x28'
Single and Double Shell
Kilns, 6'x60', 4'x45', 8'x80' & 5½'x7'6"x60'.

BALL, ROD & TUBE MILLS & CLASSIFIERS
2—5'x22' A.C. Tube Mills
4½'x16", 5'x22', 6'x22", 8'x22" & 10'x36" Hardinge Conical Ball Mills.
6'x6', 6'x10', 7'x6' and 8'x6' Cylindrical Ball Mills
8', 10' & 16' Mechanical Air Separators.
36" & 60" Spiral and 6x14 Hardinge Classifier.
5'x12', 5'x14' & 8'x12' Rod Mills, Marcy, Hardinge.
Dings 1-R-3-60" Rolls, Mag. Separator.
200, 400 & 500 HP—Double Drum Mine Hoists
75, 300, 450, 500 & 600 HP Single Drums.

STEEL STORAGE TANKS
40—10,000 Gal. R. R. Car Tanks.

PULVERIZERS
Hercules Jr. & #1 Raymond Automatic.

STANHOPE, 60 E. 42nd St., New York 17, N. Y.

Diamond Core Drill Rig
Sullivan wheel mounted complete rig
$1,900.00. A bargain.
Independent Stave Co.
P.O. Box 104, Lebanon, Mo.

Professional Services

ASSAYING
CONSULTING
PROSPECTING
ORE TESTING

RESEARCH
METALLURGY
MILL DESIGN
MINE MANAGEMENT

AGENCE MINIERE & MARITIME S.A.
Sworn weighers, samplers & Assayers of Ores, Metals. Representatives of shippers at European ports & Works. *Market surveyors and commercial advisers assuring sales direct to consumers*
2, rue Van Bree, Antwerp (Belgium)

RALPH ADAIR
Consulting Mining Engineer
Ore Dressing, Exploration, Plant Design.
Bull Mtn. Road, Asheville, N. C.
Ph. 4-1693

BEHRE DOLBEAR & COMPANY
Consulting Mining Engineers and Geologists
11 Broadway, New York 4, N. Y.

BLANDFORD C. BURGESS
Consulting Engineer
Industrial Mineral Specialist
Appraisals Mineral Surveys
Plant Design
Prospecting Development—Efficiency
Ground Water Studies
Box 350 Monticello, Ga.

HORACE CUSHMAN CRANDALL
Consulting Engineer
Design — Supervision — Investigations — Reports
Port and Harbor Works — Sea Walls
Piers — Wharves — Bulkheads
Shipyard Facilities — Foundations
480 Lexington Ave., New York 17, N. Y.

DICKINSON LABORATORIES
Assayers—Chemists—Metallurgists—Umpire Work
Ore Shippers Representatives at Local Plants
Samplers - Analysts at Mexican Border Points
1300 West Main St. El Paso, Texas

ABBOT A. HANKS, INC.
ASSAYERS—CHEMISTS
Est. 1866
Spectrographic Analysis
Shippers Representative
634 Sacramento Street
San Francisco 11

E. LEE HEIDENREICH, JR.
Consulting Engineers
Crushing Plants Quarries
Milling Plants Plant Design
Plant Layouts Appraisals
75 Second St., Newburgh, N. Y.
9 So. Clinton St., Chicago 6, Ill.

HERON ENGINEERING CO.
Surveys, Reports, Designs and Estimates for Mine, Metallurgical and Industrial Installations, Including Power Plants, Railroads, Tramways, Water Supply and Waste Disposal Systems.
2000 South Acoma, Denver 10, Colorado
Chama, New Mexico

HOLMES & NARVER, INC.
Engineers • Constructors
Design and Construction of Mining and Metallurgical Plants and Supplementary Facilities
828 South Figueroa Street
Los Angeles 17
Trinity 8201

KELLOGG KREBS
Metallurgical Engineer
Mineral Dressing Consultant
564 Market St. Telephone:
San Francisco 4, Calif. SUtter 1-6613

C. P. KEEGEL
Mining and Metallurgical Engineer
Administration Appraisal
Specializing in Management and Consultation in Latin America
707 S. 6th St., Las Vegas, Nevada
Telephone 571

LEDOUX & COMPANY, Inc.
Metallurgical Chemists — Assayers
Spectroscopists
Samplers — Weighers
Representatives of Shippers of Ores and Metals at Buyers Works
Office and Laboratories
359 Alfred Ave., Teaneck, N. J.

ROBERT S. MAYO
Civil Engineer
Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts. Special Equipment for Underground or Subaqueous Construction.
Lancaster, Penna.

ROBERT B. McELWAINE
Consulting Mining Geologist
P. O. Box 127
Little Rock, Arkansas

ARNOLD H. MILLER
Consulting Engineer
General Mine, Mill and Industrial Appraisals
Plant Design, Mechanization and Improvement
Cable: "ALMIL." Tel. Cortland 7-0635
120 Broadway, New York 6

NEW WORLD EXPLORATION RESEARCH & DEVELOPMENT CORP
Foreign & Domestic Consultants
Geology Geophysics
Mine Management
Contract Diamond Drilling
Box 1206 Reno, Nevada

ARTHUR NOTMAN
Consulting Mining Engineer
40 Wall St., 19th Floor
New York, N. Y., U.S.A.
Telephone WHitehall 4-42998

RODGERS PEALE
Consulting Mining Geologist
315 Montgomery Street
San Francisco 4, Calif.

AMEDEE A. PEUGNET
Consulting Mining Engineer
Telephone MAin 1431
20 N. 7th St., St. Louis 1, Mo.

ROGER V. PIERCE
Mining Engineer Specialist
Underground Mining Methods. Cost Cutting Surveys—Production Analysis
Mine Mechanization—Mine Management.
1596 Wasatch Dr., Salt Lake City, Utah

LUCIUS PITKIN INC.
Mineralogists—Assayers
Chemists—Spectroscopists
SHIPPERS REPRESENTATIVES
Main Office—Laboratories
Pitkin Bldg.—17 Fulton St.
New York 7, N. Y.

SMITH-EMERY CO.
Assayers and Chemists
SPECTROGRAPHIC ANALYSES
920 Santee Street
Los Angeles 15, Calif.

MARVIN J. UDY
Inorganic Chemistry Electrochemistry
Electric Furnace Smelting
Process Metallurgy
Ferro-Alloys, Calcium Carbide, Phosphorus
Telephone 2-6294
546 Portage Rd. Niagara Falls, N. Y.

WALKER & WHITE, Inc.
Umpire, Assayers, Chemists
Shippers Representatives
409 Pearl St. New York City

WEISS GEOPHYSICAL CORP.
Mining geophysical surveys with aerial and ground magnetic, gravimetric seismic, and electrical methods. Experienced crews for systematic work in any part of the world.
100 Park Avenue ORegon 9-1300
New York 17,N.Y. Cable: "Geophysics"

HARRY J. WOLF
Mining and Consulting Engineer
Examinations — Valuations — Management
420 Madison Avenue
New York 17, N. Y.
Cable: MINEWOLF
Tel.: Plaza 9-1700

J. W. WOOMER & ASSOCIATES
Consulting Mining Engineers
Modern Mining Systems and Designs
Foreign and Domestic Mining Reports
National Bank Bldg., Wheeling, W.Va.
Union Trust Bldg., Pittsburgh, Pa.

Profitable Mine Operation—

calls for operating efficiency all along the line. These specialists in various phases of mine operation can aid you materially in determining quick, economical solutions to your mining problems that make for more efficient operations, resulting in lower costs and a consequent greater return on your investment. Consult them!

THIS KUE-KEN PAID FOR ITSELF IN THREE WEEKS!

BALL MILL CAPACITY INCREASED 46%

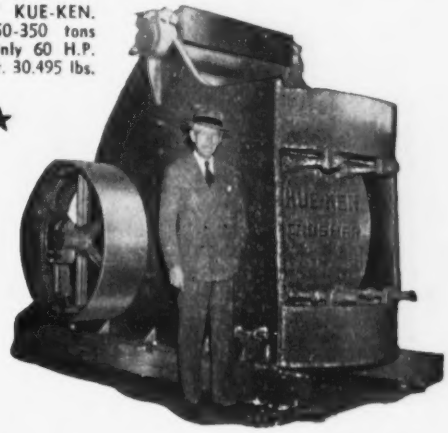
A Peruvian operator, using a 24" x 12" Blake type crusher requiring 35 H.P., to supply his 6' x 5' Ball Mill with feed, was obtaining a maximum mill capacity of 7.28 tons per hour. A 6" x 12" KUE-KEN crusher requiring only 15 H.P. was then installed to replace the Blake type. Because of the finer feed produced by the KUE-KEN, Ball Mill capacity immediately jumped to 10.71 tons per hour . . . an increase of over 46%! The operator claims that the KUE-KEN actually paid for itself, including transportation and installation, in the first three weeks of operation!

ONLY KUE-KEN crushes with firm direct strokes that practically eliminate jaw plate abrasion. "CRUSHING WITHOUT RUBBING".

ONLY KUE-KEN operates at 375 crushing strokes per minute (compared with 250-300 RPM for other well known makes of crushers), providing far greater capacity, and a finer more uniform product.

ONLY KUE-KEN seals all mechanism against dirt and dust in a "crankcase type" filtered oil bath to permit safe, high-speed long life operation.

42" x 27" KUE-KEN. Capacity 250-350 tons per hour. Only 60 H.P. required. Wt. 30,495 lbs.



Learn how you can do *any* crushing job faster, better and at less cost with a KUE-KEN Balanced Crusher.

★

Write for factual data.

STRAUB MFG. CO.

522 CHESTNUT STREET • OAKLAND 20, CALIF. KUE-KEN Pronounced "QUE-KEN". U.S. and foreign patents pending

Pennsylvania Crusher Co., Exclusive Licensed Eastern Manufacturer and Distributor, Broad and Arch Streets, Philadelphia, Pa.

Sir W. G. Armstrong Whitworth & Co. (Ironfounders) Ltd., Authorized Licensed Manufacturer and Distributor. Close Works, Gateshead-upon-Tyne, England.

Lower per foot drilling costs with

ASCOLITE • NICOLITE • BRONZOLITE

DIAMOND BITS BY

EST. 1908 **ANTON SMIT & CO. INC.**

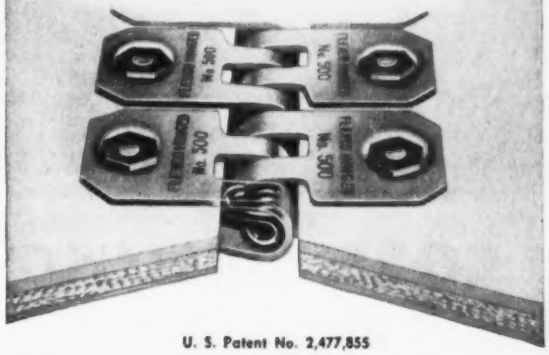
Importers and Dealers • Carbons, Bortz, Ballas
Manufacturers of Diamond Tools

333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

Send for catalogs

. . . the new separable

FLEXCO HINGED
BELT FASTENERS



U. S. Patent No. 2,477,855

- ✔ For joining underground extension conveyors.
- ✔ A FLEXCO fastener that is HINGED. Has removable hinge pin.
- ✔ Troughs naturally, operates smoothly through take-up pulleys.
- ✔ Strong, durable . . . pull or tension is distributed uniformly across joint.
- ✔ For conveyor belts ⅜" to ½" thick.

Order From Your Supply House. Ask for Bulletin HF 500.

FLEXIBLE STEEL LACING CO
4635 Lexington St., Chicago 44, Ill.

FLOTATION TESTING

COMPLETE ORE TESTING SERVICE — LABORATORY AND PLANT TESTING

EXPERIENCE UNLIMITED

PERSONALIZED . . .

. . . TO GIVE YOU A GREATER DOLLAR RETURN FROM THE TREATMENT OF YOUR ORES.

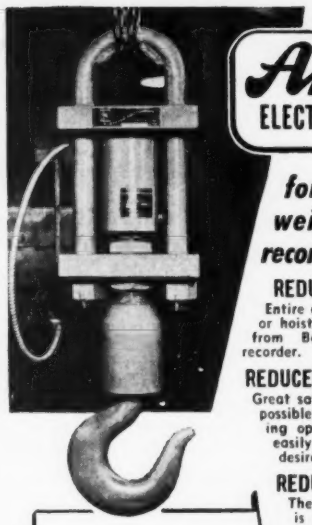
SULPHIDE AND NON-SULPHIDE ORE TREATMENT PROBLEMS SOLICITED

WRITE TO

MINERALS SEPARATION SERVICE • EQUIPMENT

BOOTH ENGINEERS

146 So. West Temple • Salt Lake City, Utah



Ametron
ELECTRONIC CRANE SCALE

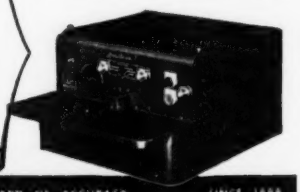
for heavy industrial weighing and remote recording

REDUCES INSTALLATION COSTS!
Entire assembly ready to attach to crane or hoist. Only a cable connection is run from Baldwin Load Cell to remote recorder.

REDUCES OPERATING COSTS!
Great savings in time and man power are possible because weighing and transporting operations are combined. Scale is easily removed from crane whenever desired.

REDUCES MAINTENANCE COSTS!
The only element subjected to weight is the sturdy load cell, which can be easily replaced or interchanged

Remote Recorder prints exact weight on tape, ticket or cards.



Write for free Ametron Brochure F-2

THE STANDARD OF ACCURACY SINCE 1888

STREETER-AMET COMPANY

4101 N. RAVENSWOOD AVENUE • CHICAGO 13, ILLINOIS

Branches in Pittsburgh, Pa. and Birmingham, Ala.

PLACER GOLD

Most accurately and economically tested for . . . with the

EMPIRE DRILL

NEW YORK ENGINEERING COMPANY

75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

CORE DRILLING

"We look into the Earth"

—anywhere!

- Mineral Prospecting
- Foundation Test Borings and Grouting
- Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.

DRILLING CONTRACTORS & MFRS.

1205 Chartiers Ave. **PITTSBURGH, PA.** WAlnut 1-5816

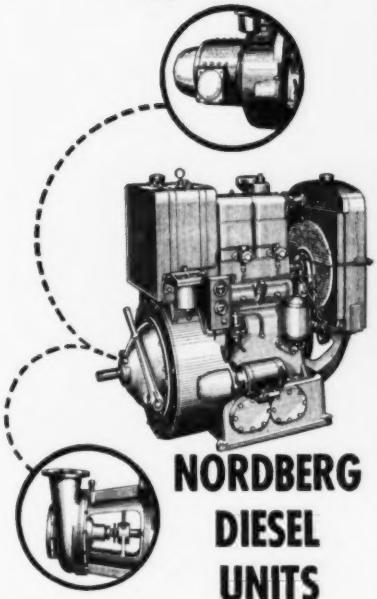
Write for Free Brochure on:

- **Piling • Pile Shells • Pile Fittings**
- **Prefabricated Piping**
- **SPEED-LAY System**

ALBERT pipe supply co., inc.

BERRY AT NORTH 13TH ST. • BROOKLYN 11, N. Y.

Versatile—Low Cost Power for Hundreds of Applications



NORDBERG DIESEL UNITS

IN HUNDREDS of applications in many industries . . . for power units on shovels, for crane magnets, for pumps in mines, quarries, and irrigation, for petroleum production pumping, for auxiliary generating sets, ashore and afloat, for standby lighting units in manufacturing plants . . . that's where you'll find NORDBERG "4FS" Diesel Engines on the job, producing dependable power at low operating and maintenance costs.

Built in 1, 2, and 3-cylinder sizes from 10 to 45 hp, these heavy duty medium speed units are available as straight power units with stub shaft or clutch power take off—as packaged generator sets producing from 6 to 30 K.W.—and as "packaged" centrifugal pumping units.

Send the coupon today for more details.

NORDBERG
BUILDERS OF AMERICA'S LARGEST LINE OF HEAVY-DUTY DIESELS

Mail this coupon Today

Nordberg Mfg. Co.
Milwaukee, Wis. 4-352-ICQFMOP

Please send literature describing the full line of Nordberg "4FS" Diesel Power Units.

Your Name_____
Company_____
Address_____
City_____ Zone____ State_____

SPECIFY

FLEXIPIPE® the quality ventilating tubing

Flexipipe is now available with Rope Seam Suspension *at no additional cost.* The newest, best, quickest suspension . . . eliminates special accessories and suspension wires . . . *all you need is a nail.* It equalizes strain on the tubing.

Flexipipe is efficient, serviceable, economical. Jute and heavy-duty grades available in a variety of lengths and diameters to meet your requirements.

Write for complete information and sample.

Bemis Bro. Bag Co.
408-E Pine St.,
St. Louis 2, Mo.

Eliminate 70% to 90% of Conveyor Downtime

Cedarapids
Schrock
Built by IOWA
MOTORIZED HEAD PULLEYS
eliminate maintenance on chains, belts, sprockets, Universal drives, countershafts, etc.

EVERYTHING is contained INSIDE the pulley shell!

HERE'S a money-saving departure from conventional conveyor drives. A Cedarapids-Schrock *Motorized* Head Pulley is simply a new application of the long-proven gear reduction drive, with everything . . . electric motor, reduction gears and all moving parts . . . contained inside the drum, completely protected from grit, dirt and weather and with no outside parts or motors to service. 70% to 90% of conveyor trouble and downtime is saved by eliminating the exposed parts necessary with conventional pulley drives. In operation, the pulley shell rotates about the electric motor which is held stationary by a torque arm attached to the conveyor frame. The speed of the shell depends on the combined reduction ratio of the pinions and gears inside the shell. Compact, easy-to-install, job-proved Motorized Head Pulleys are available in sizes from 5 to 30 HP and in various widths.

Find out all the advantages of converting your belt conveyor or belt-bucket elevator installations to *motorized* efficiency before you need head pulley replacements. See your distributor today, or write for Bulletin MP-1.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

Built for sale in Arizona, California, Nevada, New Mexico, Southern Oregon, Southwestern Utah and Texas by
YUBA MANUFACTURING CO.
(Pulley and Sprocket Department)
Benicia, Calif.

You Can Extend Life of ENGINES, TRANSMISSIONS and DIFFERENTIALS

With Allison Torqmatic Drives

BASED on user records, heavy-duty trucks equipped with Allison TORQMATIC CONVERTERS and TRANSMISSIONS *last longer and cost less to operate* than trucks with mechanical drives.

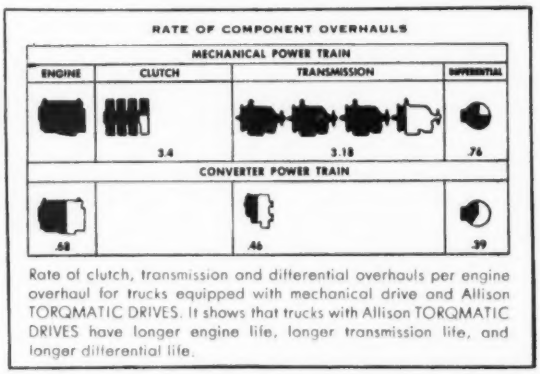
Records show that Allison TORQMATIC DRIVES boost truck availability, enabling operators to improve their schedules and, thus, they can do more business.

Trucks — and other heavy equipment — with Allison TORQMATIC DRIVES use the flexibility of the converter to start heavy loads and make shock-free gear-shifts at full power. The Allison TORQMATIC DRIVES automatically balance engine power with the load requirement. Its automatic operation makes the driver's job easier and reduces wear on the whole unit—thus cutting maintenance cost.

You are interested! Attach this advertisement to your letterhead and send it to Allison. You will receive detailed evidence on what these Allison TORQMATIC DRIVES will do for you.

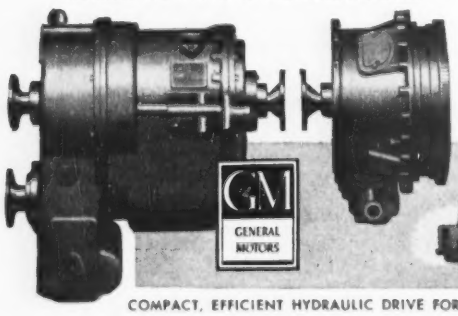
And the next time you're ordering heavy-duty equipment, you'll ask your dealer or manufacturer for units with Allison TORQMATIC DRIVES.

ALLISON *Division of* GENERAL MOTORS
Box 894 MM, Indianapolis 6, Indiana

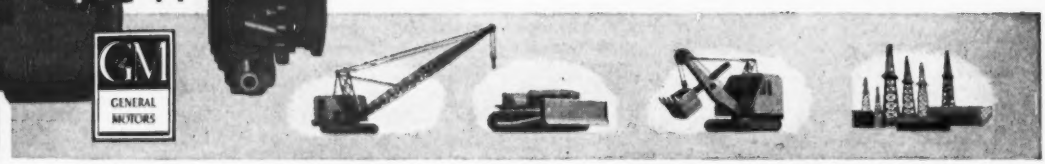


Rate of clutch, transmission and differential overhauls per engine overhaul for trucks equipped with mechanical drive and Allison TORQMATIC DRIVES. It shows that trucks with Allison TORQMATIC DRIVES have longer engine life, longer transmission life, and longer differential life.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES



COMPACT, EFFICIENT HYDRAULIC DRIVE FOR TRUCKS * CRANES * TRACTORS * SHOVELS * DRILLING RIGS

ALPHABETICAL INDEX TO ADVERTISERS

Where an asterisk * precedes manufacturer's name, more detailed information may be found in the *1951-52 edition of the Mining Catalog.*
(This index is published as a convenience to the reader. Every care is taken to make it accurate, but E&MJ assumes no responsibility for errors or omissions.)

Aero Service Corporation 26
Albert Pipe Supply Co. 210
*Allen-Sherman-Hoff Pump Co. Second Cover
*Allis-Chalmers Mfg. Co. (General Machinery) .....37, Third Cover
*Allis-Chalmers Tractor Div. 17
Allison Div. General Motors 212
American Chain & Cable (Wire Rope Sling Dept.) 63
American Forge Co. 161
*American Manganese Steel Div. (Am. Brake Shoe Co.) 167
American Wheelabrator Co. 188
Armstrong, Bray & Co. 196
*Atlas Car & Mfg. Co. 162
Atlas Powder Co. 58

*Baldwin-Lima-Hamilton Corp., Construction Equipment Div. 51
*Barber-Greene Co. 202
*Bemis Bros. Bag Co. 211
Bethlehem Steel Co. 16, 64
Booth Engineers 210
Bucyrus-Erie Co. 44
*Buell Engineering Co. 198
Bullard Co., E. D. 191

California Wire Cloth Corp. 149
*Card Iron Works Co., C. S. 157
Caterpillar Tractor Co. 115, 214
Chester Cable Corp. 176
*Christensen Diamond Products Co. 150
*Chicago Pneumatic Tool Co. 34A
Cleveland Vibrator Co. 161
*Colorado Fuel & Iron Corp. 149
Colorado Iron Works Co. 60, 61
*Continental Gin Company 59
Copco Eastern, Ltd. ..... -147
Copco Pacific, Ltd. 147
*Crane Co. 54
Crucible Steel Co. of America 120
*Cummins Engine Company, Inc. 181

*Denver Equipment Co. 20
*Dings Magnetic Separator Co. 56
Dodge Manufacturing Corp. 36
*Dorr Company 111
*Dow Chemical Co. 122
duPont de Nemours & Co. (Inc.) (Explosives Dept.) 193

*Edison Storage Battery Div., Thomas A. Edison, Inc. 135
*Eimco Corporation 19, 31, 136, 137
*Electric Storage Battery Co. 45
Engineers Syndicate Ltd. 196
*Ensign Bickford Co. 30
*Euclid Road Machinery Co. 173

Farval Corporation 27
Filter Fabrics, Inc. 162
Flexible Steel Lacing Co. 209

Galigher Co. 18
*Gardner-Denver Co. 197
Gates Rubber Co. 49
*General Electric Company 32, 33, 190
*General Electric Company (Construction Materials Div.) 40
General Tire & Rubber Co. 169
Godoy & Co., Inc., E. A. 150
*Goodman Manufacturing Co. 29
Goodrich Co., B. F. 4
Goodyear Tire & Rubber Co. 21
Greensburg Machine Co. 156

*Hardinge Co., Inc. 140, 141
Harnischfeger Corp. 35
Hayes Steel Products, Ltd. 153
*Hendrick Manufacturing Co. 200
Hercules Powder Co. 39
Hotel Sherry-Netherland 158
Hough Company, Frank C. 199
Hyster Company 185

Industrial Brownhoist Corp. 168
International Harvester Co. 171
International Harvester Co. 190
International Nickel Co. 175
Iowa Manufacturing Co. 211

*Jeffrey Manufacturing Co. 187
Johnson Co., C. S. 89
*Jones & Laughlin Steel Corp. 189
*Jones Foundry & Machine Co., W. A. 179
*Joy Manufacturing Co. 12, 13, 55

*Kennedy-Van Saun Mfg. & Engrg. Corp. 126
Klockner-Humboldt-Deutz, A. G. 180
Koehring Company 8, 9

Lake Shore Engineering Co. 203
LeRoi Company 10, 11
*Leschen & Sons Rope Co., A. 170
LeTourneau, Inc., R. G. 22, 23
*Link-Belt Company 62
Lubriplate Div. Fiske Bros. Refining Co. 198

Mace Company 160
*Mancha Storage Battery, Locomotive Div. 29
Manhattan Rubber Div. 42
*Manitowoc Engineering Corp. 182
Marion Power Shovel Co. 174
*Martindale Electric Co. 165
McGraw-Hill Book Co. 194
*Merrick Scale Mfg. Co. 165
Michigan Pipe Company 170
Mine & Smelter Supply Co. 60, 61
*Mine Safety Appliances Co. 201
*Morris Machine Works 146
Morse Bros. Machinery Co. 200

*National Filter Media Corp. 143
*National Malleable & Steel Castings Co. 177
*Naylor Pipe Co. 142
New York Engineering Co. 210
Newport Industries 160
*Nordberg Manufacturing Co. 14, 211
Northern Blower Co., The 178
Northwest Engineering Co. 15

Ohio Brass Co. 57, 125
*Osmose Wood Preserving Co. of America 148

Parsons Co. 8, 9
Pennsylvania Drilling Co. 210
Philadelphia Quartz Co. 164
*Pioneer Engineering Works 46, 47
Pittsburg Lectromelt Furnace Corp. 183
Portland Woolen Mills, Inc. 195

Raybestos-Manhattan, Inc. 42
*Republic Rubber Div. of Lee Rubber & Tire Corp. 194
*Roots-Connersville Blower Div. Dresser Industries, Inc. 196
Ryerson & Sons, Inc., J. A. 113

*Sauerman Bros. 155
Searchlight Section 204-207
Sheffield Steel Corp. 184
*Simplex Wire & Cable Corp. 28
Simplicity Engineering Co. 202
*Sintering Machinery Corp. 152
Skookum Co., Inc. 158
*Smidth & Co., F. L. 172
Smit & Co., Anton 209
*Smit & Sons, Inc., J. K. 157
*Sprague & Henwood, Inc. 156
St. Paul Hydraulic Hoist 195
Standard Oil of California 139
*Stephens-Adamson Mfg. Co. 34
Stoody Company 131
Straub Mfg. Co. 209
Streeter-Amet Co. 210
*Sturtevant Mills Co. 52

Texas Company 6, 7
Texas Gulf Sulphur Co. 38
Thew Shovel Co. 186
*Thomas Flexible Coupling Co. 127
Throwaway Bit Corp. 48
*Timken Roller Bearing Co. ..Fourth Cover
*Traylor Engineering & Mfg. Co. 43, 65
Turner & Hawes Engineering Co. 191
*Twin Disc Clutch Co. 138

United States Rubber Co. 159

Victaulic Co. of America 134
*Vulcan Iron Works Co. 50

Walworth Company 53
Warren Foundry & Pipe Co. 154
*Wedge Wire Corporation 164
Western Machinery Company 145, 151
Western-Knapp Engr. Co. 151
Western Precipitation Corp. 163
Westinghouse Electric Corp. 24, 25, 132, 133
*Wheel Trueing Tool Co. 41
White Motor Truck Co., Sterling Div. .. 192
*Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp. Insert between pps. 34, 35
*Wilfley & Sons Co., A. R. 66

Yuba Manufacturing Co. 144

PROFESSIONAL SERVICES 208

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 204
Positions Wanted 204
Employment Services 204

SPECIAL SERVICES 204
Contract Work 204

BUSINESS OPPORTUNITIES
Offered 204

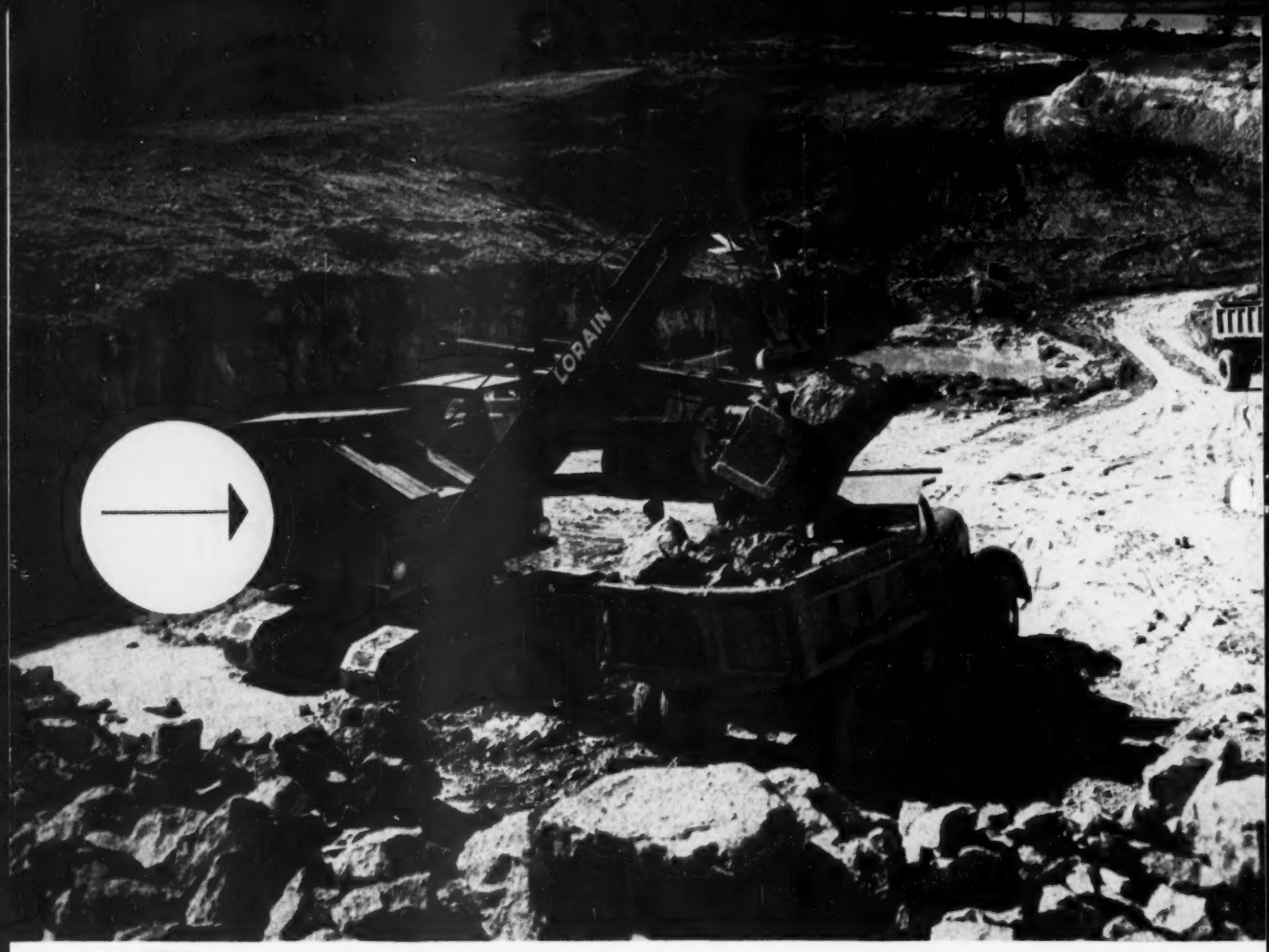
PROPERTY
For Sale 204

EQUIPMENT
(Used or Surplus New)
For Sale 204, 207

WANTED
Equipment 204

ADVERTISERS INDEX

Carlyle Rubber Co., Inc. 206
Dyer, Frederick W. 204
Eastern Kentucky Scrap Co., Inc. 206
Electric Equipment Co. 207
Florence Machinery & Supply Co. 206
Glazer Steel Corp. 205
Heineken, Inc., W. P. 206
Independent Stave Co. 207
Judge, Frank M. 207
Land Inc., L. J. 205
Lawler Co. 206
Lefton Industrial Co. 206
MacCabe Co., T. B. 207
Morse Bros. Machinery Co. 205
New World Exploration 204
O'Neill, A. J. 206
Pierce Cable Co. 204
Pierce Equipment Sales Co., Roger 206
Smith Co., H. Y. 205
Smith, Paul F. 206
Stanhope Inc., R. C. 207
Sullivan, F. J. 204
Vulcan Detinning Co., The 205
Wabash Employment Agency 204



CATERPILLAR POWER...

CHOICE OF EXPERIENCE

"I've operated Lorains for 40 years," says the veteran operator of this Lorain shovel for the Dulin Bauxite Co. of Sweet Home, Ark., "and Caterpillar power units have done the best under every condition." A Caterpillar D315 powers this ¾-yard shovel at the Dixson Pit near Sweet Home, which loads about 250 tons of bauxite daily. Material varies from fine grain to boulders the size of the shovel's bucket. The Cat D315 burns 1.6 gallons of low-cost fuel per hour without fouling.

Leading equipment manufacturers can supply Caterpillar Diesel Engines in the machines they build. Twelve sizes of engines to 500 HP and electric sets to 315 KW are available. Field records on the toughest, dustiest jobs prove that it pays to *specify* Caterpillar power for your mining operation. Simplicity and ruggedness of Caterpillar construction mean reliable performance at a minimum cost for fuel, maintenance and repairs.

All Caterpillar Dealers carry a large stock of factory replacement parts, because it takes genuine Caterpillar parts to give genuine Caterpillar performance. What's more, your nearby Caterpillar Dealer is standing by to provide on-the-job service 24 hours a day. Let him tell you about the Caterpillar line of Diesel Engines and Electric Sets. There's Cat power to fit your job.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

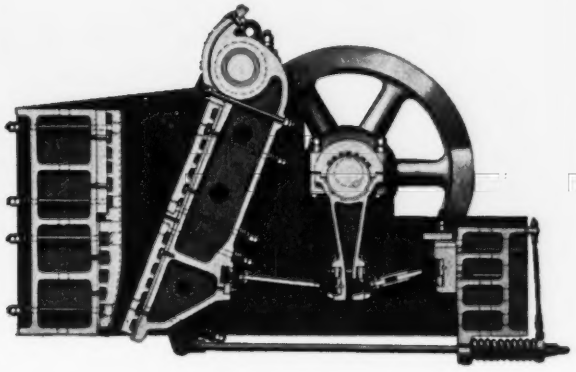
Diesel Engines
Electric Sets

DRY ROLLING TOGGLES ON A-C JAW CRUSHERS

Last 4 to 6 Times as Long

AS OLD TYPE JAW CRUSHER TOGGLES!

ALLIS-CHALMERS
Jaw Crushers



FROM A ROCK AND SAND PLANT...

Dry toggles installed 2½ years ago still going strong!

FROM A CEMENT PLANT...

After more than 2 years' operation, dry rolling toggles show relatively no wear!

FROM A MINING COMPANY...

New dry rolling toggles last 3 months, operating 24 hours a day. Old toggles lasted only 1 to 3 weeks!

FROM A QUARRY OPERATOR...

Dry rolling toggles installed 2½ years ago show very little wear.

Users names on request.

ACTUAL FIELD REPORTS show Allis-Chalmers dry rolling toggles (which are still in use) have already lasted *up to six times* as long as conventional toggles. No wonder crushing men are enthusiastic!

True rolling action of toggle ends and seats — instead of damaging sliding action — results in much less wear. Friction is eliminated — toggle ends operate cold even after a day's crushing.

Maintenance is less, too. No lubrication is required. Toggle ends operate dry. It's safer and cleaner around the crusher because there are no oil lines, no messy oil drip.

For more facts, get in touch with the Allis-Chalmers representative in your area, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3824

ALLIS-CHALMERS

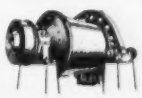
Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Hammermills

Vibrating Screens

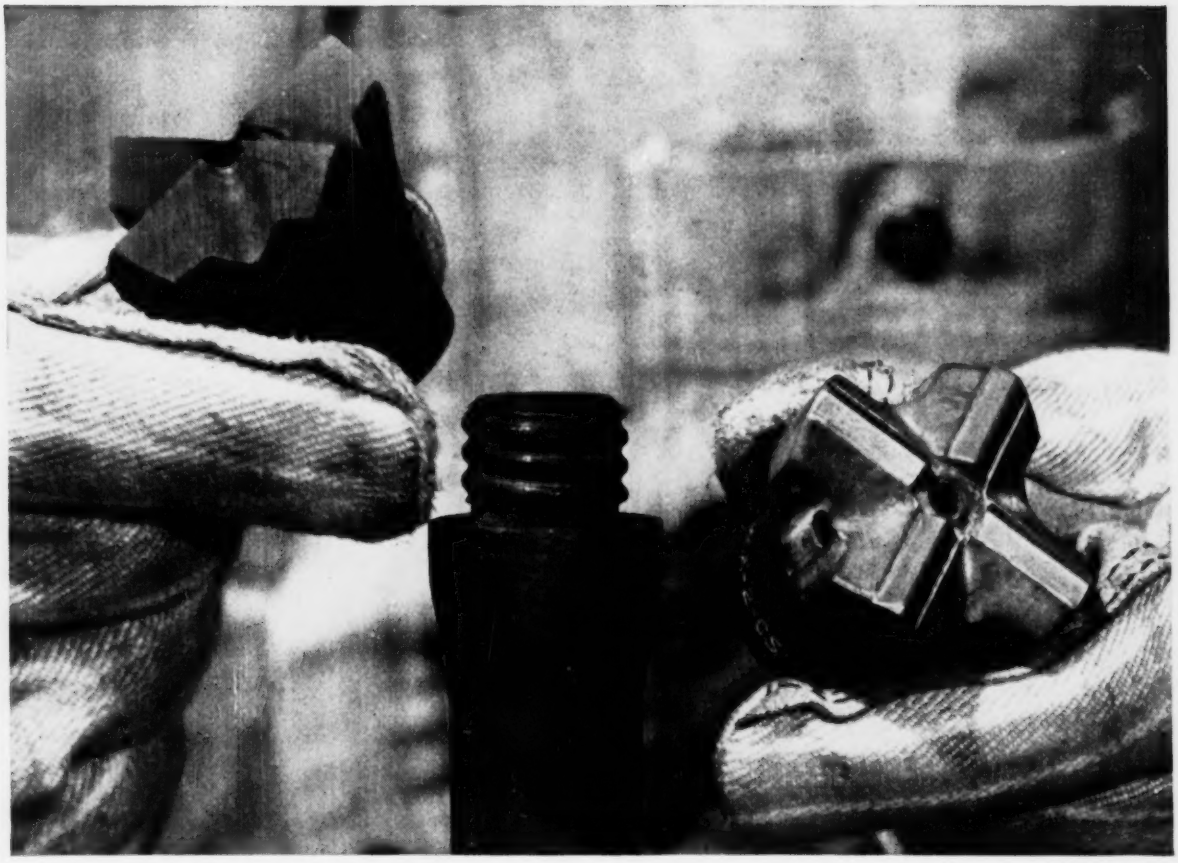
Jaw Crushers

Gyratory Crushers


Grinding Mills

Kilns, Coolers, Dryers

NO NEED TO SWITCH STEELS WHEN YOU NEED TO SWITCH BIT TYPES!



Both Timken® bit types fit the same steel!

YOU don't need to switch steels, or stock more than one kind, when you use Timken® interchangeable rock bits. Timken multi-use and carbide insert bits both fit the same threaded drill steel so that you can change quickly to the most economical bit as the ground changes. And you can do it right on the job!

In ordinary ground, when full increments of steel can be drilled, Timken multi-use bits, with correct and controlled reconditioning, will give you the lowest cost per foot of hole.

If you hit hard and abrasive ground, you can switch quickly to Timken carbide insert bits. They're your best bet for maximum speed drilling, constant-gage holes, small diameter blast holes and very deep holes.

Be sure to have both types of Timken bits on hand and you'll have the best answer to every one of your drilling problems.

Timken multi-use and carbide insert bits are interchangeable in each thread series. And both types have these three important advantages: (1) made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, (3) quickly and easily changed.

Timken rock bit engineers have 20 years' experience in solving drilling problems. Let them help you select the best bits for *your* job. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

your best bet for the best bit
. . . for <u>every</u> job